NOW You Can Build More Accurate Tests

CONSTRUCTING TESTS AND GRADING
In Elementary and High School Subjects

This book trains the teacher, and student of teaching, to build better objective and subjective tests, and to set up a grading system that is accurate, comprehensive, and valid.

It contains the most complete treatment of test construction yet attempted. Many of the objective forms are now published for the first time. Moreover, the plans for grading subjective examinations, as presented in this book, are more reliable than older methods. Several of them (especially the ones that apply to mathematics) have never before appeared in a textbook.

The teacher who employs the rules for building objective and subjective tests given in this book, and who follows the illustrations, will be in a position to devise tests designed specifically to measure, analyze, and diagnose exactly what his pupils have learned. Also, the tests will be applicable to the specific needs and circumstances of the teacher's own class.

> Your opinion of this book both
> as a text in general and as a
> text for use in your own classess
> will be very much appreciated.
> Please use the enclosed postage-
> free cared attached.

PRENTICE-HALL, Inc.

List Price $3.25

CONSTRUCTING TESTS
AND GRADING
IN ELEMENTARY AND HIGH SCHOOL SUBJECTS

PRENTICE-HALL EDUCATION SERIES

E. George Payne, Editor

A Philosophy of Education, by Quincy A. Kuehner.
Constructing Tests and Grading in Elementary and High School Subjects, by Henry Daniel Rinsland.
Creative Education, by Charles Sumner Crow.
Current Social Problems, by William Withers.
Development of Modern Education, by Frederick Eby and Charles Flinn Arrowood.
Education in a Democracy, by Alonzo F. Myers and Clarence O. Williams.
Elements of Research, by Frederick L. Whitney.
Experimental Pedagogy, by W. A. Lay; trans. by Adolf Weil and Emanuel K. Schwartz; with an introduction by Paul R. Radosavljevich.
Management and Teaching Technique in the Elementary School, by George A. Retan.
Modern European Educators, by Adolph E. Meyer.
Our Racial and National Minorities, edited by Francis J. Brown and Joseph S. Roucek.
Principles and Methods of Adult Education, by A. D. Mueller.
Problem Studies in School Administration, by Ernest C. Witham.
Problems in Teacher-Training, edited by Alonzo F. Myers.
Psychology of Elementary School Subjects, by W. H. Gray.
Radio for the Classroom Teacher, by Margaret Harrison.
Readings in Educational Sociology, 2 vols., edited by E. George Payne.
Science in the New Education, by S. R. Slavson and Robert K. Speer.
Social Studies Instruction in the Secondary Schools, by Robert E. Swindler.
Speech Correction on the Contract Plan, by Ruth B. Manser.
Speech for the Classroom Teacher, by Dorothy I. Mulgrave.
Statistics in Education and Psychology, by E. R. Enlow.
Teaching for Tomorrow, by Charles Russell.
Teaching Speech in Secondary Schools, by Letitia Raubicheck.
The Education of the Negro in the American Social Order, by Horace Mann Bond.
The Human Personality, by Louis Berg.
The Menace of Narcotic Drugs, by E. George Payne.
The Principles and Practice of Teaching English, by Roscoe Edward Parker.
The Teacher and School Organization, by Leo M. Chamberlain.
The Teacher and the Curriculum, by John P. Wynne.

CONSTRUCTING TESTS
AND GRADING

IN ELEMENTARY AND HIGH SCHOOL SUBJECTS

BY

HENRY DANIEL RINSLAND, Ph. D.

PROFESSOR OF SCHOOL MEASUREMENTS
UNIVERSITY OF OKLAHOMA

Editor's Introduction

THE matter of testing the results of instruction has received greater emphasis than any other aspect of recent educational development and has represented the most marked advance in the scientific movement in education. The attempt to determine scientifically the results of education has not only made teachers conscious of important phases of learning but has also tended to prevent injustices to the pupils instructed. In these respects the testing movement represents the scientific advance in education at its best.

It is important to point out the fact that American educators are facing a real problem in the inadequate measurement of what they are really teaching and in the further indication that no real progress can be made in attaining the larger ends of education until teachers succeed in doing reasonably well what they are, for the most part, now doing poorly. Because of the practical necessity of doing better the things we are now doing in order to attain the larger educational program, the book which provides the technique for this improvement makes a distinct contribution to our educational advance, particularly when the book frees the teacher from standardized tests, provides him with instruments he may use, and equips him with the technique for constructing more adequate measures of his own efforts. Therefore, we can say with conviction that this book is a unique contribution to our educational literature and one that will be of indispensable service to the teachers in the elementary and secondary schools in improving their teaching technique and in measuring the results of their instruction.

E. GEORGE PAYNE

v

Preface

THIS book is designed to teach students of education and teachers the methods of building reliable and valid objective tests, better methods of grading subjective examinations than those usually employed, and the use of a grading system that is reliable, valid, and comprehensive.

The tests that teachers construct are more important for both diagnosis and grading, in most subjects, than published standardized tests. First of all, teachers make up many more tests than they can buy. Second, all standardized tests do not cover exactly what is taught in units, projects, and textbooks, as these tests, by their very nature and wide distribution, must be more general than specific. The tests that the teachers make are more valuable for grading than standardized tests, because most standardized tests contain no instructions, and but a few contain indefinite suggestions, as to how scores may be converted into grades. Since there are many grading systems, a grading system must be defined before a grade can have definite meaning.

This book presents many forms of objective tests and many rules for building objective tests in almost every elementary and high school subject. Teachers should not only consult samples in their respective subjects at elementary or at high school levels, but they should examine all samples in all subjects at both elementary and high school levels. There are literally hundreds of different objective forms published. Many of the forms here presented are original and are published for the first time. The teacher should be encouraged to design new forms for measuring the many outcomes of learnings in the subject he teaches.

The teacher employing the rules for building objective tests and following the samples in this book will be able to build tests that are as reliable as, or, in many cases, more reliable than, many published standardized tests. In many cases these tests will be much more valid and useful than standardized tests because they will be designed specifically to measure, analyze, and diagnose exactly what children have learned of what they are supposed to have learned.

While subjective, traditional, or essay examinations have been considered rather unreliable, a number of suggestions are

presented for making the scoring, rating, or grading of these examinations almost as reliable as that of the objective examination. Since essay examinations are often absolutely essential for measuring organization of knowledge and qualitative products of learning which are not objective by nature, they are essential for any comprehensive and valid measure or grading in any subject.

The hundreds of grading systems now in use have been subjected to many attacks by writers in education. Even the philosophy of grading in school is questioned, but, as Henry C. Link has said in *The Return to Religion*,[1] "And yet the marking system is one of the few definite points at which education resembles the actual world with its system of incentives and rewards, its mixture of justice and human fallibility." Many of these criticisms are valid simply because the grading system has been unreliable and invalid. Two methods of grading which are as reliable and valid as many standardized tests are discussed. The one which is highly accurate and technical is used for analysis and diagnosis by teachers and school officials, and resembles a clinical record such as those which are used in hospitals and medical clinics. It is somewhat technical and not practical for use by parents. The other system is practical and can be used as a part of the report of school progress to children and parents.

The measurement of the many phases of the complexities and intricacies of personality and conduct, which is essential for a full knowledge of a child's life and its possibilities, cannot be treated in this text. That these are important, perhaps more important under certain conditions than other phases of learnings usually classified under the term "subject matter," is admitted. But their structure is complicated by the very nature of the things measured, and often much indefiniteness is attached to the concepts of interests, attitudes, personality, and character. Their measurement should come after the teacher has learned to measure subject-matter achievement more accurately and comprehensively than is usually done by the traditional examination and uncontrolled personal judgment.

It is only through the experience and improvement of our measuring instruments of today, in the simpler phases of human learning, that we can push forward our scientific frontiers to a

---

[1] New York, The Macmillan Company, 1936, p. 154.

more accurate and comprehensive description of the personality of the whole child—the new center of the educational world.

It would be impossible to acknowledge by name the many students, associates, and teachers who have worked under the author's supervision, from whom suggestions for improving objective tests have come. Many of the new forms presented in this book are taken from masters' theses and doctorate dissertations which have been written under his supervision at the University of Oklahoma. In each of these cases, acknowledgment is made. The author hopes that his organization and presentation of the many suggestions for building objective tests, improving the grading of subjective tests, and the building and use of a fair grading system will be as useful to teachers as they have been in his own classroom testing and grading for the past decade.

                                                    H. D. R.

Norman, Oklahoma.

Contents

CONTENTS

The Need for Objective Tests in Education

I. Measurements in Civilization

Mankind has always measured. Primitive man sought measurements of distance, amount of meat, strength of weapons, and intelligence of his foes. Almost all earlier forms of measurements represented the opinions of the person doing the measuring. Man soon found that differences existed in measures of the same object. He began to invent units of measurement which were objective. The foot, known as early as Babylonian times, gradually changed from the length of anyone's foot to the length of the king's foot, and later to a definite length which has become the standard foot. The yard changed from the length of a person's arm to the standard English yardstick, which is a bar of Bailey's metal, 38 inches long and one inch square. At each end of the bar is a hole into which is inserted a plug of gold. On the face of each plug is a fine line running perpendicular to the bar, and at exactly 62 degrees Fahrenheit, according to a specially constructed thermometer which is standardized by certain rules, the distance between these two lines is the yard.

Science has largely amounted to the development of accurate and objective measuring instruments. Lord Kelvin said, "Science depends on measurements; nay, science is measurement."

There have always been measurements in education and human learning. The Chinese had an elaborate national system of examinations as early as 2200 B. C. Some form of measurement was used during the second century B. C., in the Athenian College of the Ephebi. Probably the first examinations of historic interest in our country were those held by the Boston School Committee in 1845[1]; but all of these examinations were

---

[1] Caldwell, O. W., and Courtis, S. A., *Then and Now in Education, 1845-1923*, Yonkers-on-Hudson, N.Y., World Book Company, 1923.

largely subjective, that is, the score a student made depended very largely upon the personal opinion of the scorer and the factors which he considered essential to scoring. This method of scoring or grading is called *subjective*, and it is not very accurate.

In recent years people concerned with the measurement of mental and educational products have turned to the method of science, which requires an objective measuring instrument. In measuring objectively, the opinion of the scorers is reduced to a minimum. A perfectly objective measuring instrument must yield the same measurements or scores in the hands of all competent people. This is what is meant by an accurate instrument. Greene and Jorgensen[2] state the definition of *objective* as follows: "A term used in describing tests in which no opportunity for disagreement as to correctness of response exists."

Accurate, objective measurements have replaced the errors of personal judgment in every phase of the natural sciences. Accuracy in measuring the physical organs and functions of the body has improved our knowledge of health and greatly increased our knowledge of medical treatment. If, as Bacon said, knowledge is power, we should be able to increase our knowledge of learning by making our measuring instruments more accurate. The problems of increasing our knowledge of boys and girls and what they learn are largely the problems of increasing the accuracy of measuring instruments.

The two traditional methods of measurement in education have been the subjective, or essay examinations, and school marks or grades given at the end of some administrative period, such as a month or a school year.

II. The Unreliability of Subjective or Traditional Examinations

1. Investigations showing unreliability in grading examinations. Many investigations have been reported which show the unreliability of subjective examinations. Different teachers cannot give the same paper the same grade. One of the most classical experiments was carried out by Starch and Elliott,[3]

---

[2] Greene, Harry A., and Jorgensen, Albert N., *The Use and Interpretation of Elementary School Tests*, New York, Longmans, Green and Company, 1935, p. 520.

[3] Starch, Daniel, and Elliott, E. C., "The Reliability of Grading High School Work in English," *School Review*, Vol. XX, 1912, pp. 442–457; "The Reliability of Grading Work in Mathematics," *School Review*, Vol. XXI, 1933, pp. 254–259.

who had facsimile copies made of an actual examination paper written by a pupil and sent to teachers with the request that the papers be graded. One paper in English was graded by 142 teachers from 50 per cent to 98 per cent, and a paper in geometry was graded by 114 teachers from 28 per cent to 92 per cent. One would expect some variation in the value of an English paper, but not much variation in the value of a geometry paper, where statements are either correct or incorrect. Other studies in other subjects have shown similar variabilities in grading. Ruch[4] reports the marks assigned by 91 teachers who graded three answers to a question in geography. Answer number one was graded from 2 per cent to 20 per cent, answer number two from 0 per cent to 2 per cent, and answer number three from 3 per cent to 20 per cent.

Wood[5] made a study of the algebra and geometry papers of the June, 1921, examination of the College Entrance Examination Board. The scoring on these examinations was so unreliable that if they had tested 10,000 candidates two consecutive days on two equivalent forms of the same tests and failed approximately 30 per cent, 1,279 of the 3,000 failed the first day would have passed the second day, and 1,279 who passed the first day would have failed the second day. In other words, the reliability of grading these examinations is so low that 2,558 in 10,000 candidates could not be accurately placed as passing or failing. Wood[6] shows the inaccuracy of grading by relating a humorous story connected with the grading of history papers by a group of college professors of history. One of the several expert readers after scoring a few papers wrote a model set of answers to assist in grading the other papers. This model was accidentally classed as a regular student's paper and graded by other experts as was the custom in that examination to secure accuracy. The other readers graded the paper from 40 per cent to 90 per cent.

2. Grading an arithmetic paper. The author presented to 111 of his students, who had taught arithmetic, a mimeographed copy of ten problems and one child's solution of these problems.

---

[4] Ruch, G. M., *The Objective or New Type Examinations,* Chicago, Scott, Foresman and Company, 1929, pp. 78–80.

[5] Wood, Ben D., *Measurement in Higher Education,* Yonkers-on-Hudson, N.Y., World Book Company, 1923, pp. 124–125.

[6] Wood, Ben D., "The Measurement of College Work," *Educational Administration and Supervision,* Vol. VII (September, 1921), pp. 301–304.

He requested that each problem be graded 10 per cent if perfect, 100 per cent for the ten problems; and that 75 per cent be the passing line. The total range of grades was from 21 per cent to 88 per cent. The largest number of teachers agreeing on any one grade (50 per cent) was 10. Problem number 1 was graded all the way from 0 per cent to 10 per cent.

3. Grading a letter. The author presented a letter written by a boy in answer to an advertisement in the *Daily Oklahoman* for a truck driver's job. The letter presented here is shown as nearly like the original as possible:

<div align="right">Norman okla
Lahoma street Norman</div>

Dear sir

    I seen your ad in the daily okla for a truck driver and I want the job I am a good truc driver and I am maried and have four children. write me real soon I will be over to the city to see you real soon

<div align="right">Sincerely,
JOHN DOE</div>

Nearly 100 teachers who had taught English in high school and elementary school were asked to state the school grade in which they thought this letter was written, and to give it the percentage mark they thought it deserved in that grade. This letter was rated all the way from a fair *third* grade letter to a fair *tenth* grade letter. The teacher rating it a third grade letter said that there was nothing correct about the letter. The teacher rating it a tenth grade letter said that it was written about as well as tenth grade truck drivers write, that the employer knew exactly what the truck driver wanted, and that this was the sole purpose of the letter.

4. Grading a history test. The author asked a teacher in an Oklahoma school for an average examination paper in Oklahoma history, for the test questions, and for the teacher's ideal answers. All these were mimeographed and given to nearly a hundred history and non-history teachers. The history teachers rated the examination from 37 per cent to 91 per cent. The non-history teachers agreed more closely and rated it from 46 per cent to 89 per cent. Does the teaching of history make teachers disagree more on the value of an examination paper? It would seem so. It also seems that an ideal set of answers does not greatly increase accuracy in grading.

5. Grading an ancient history examination. Two teachers in a city school in Oklahoma, Miss *Z* and Miss *T*, graded each other's subjective papers as an experiment. They made up the examination together. Miss *Z* gave an average of 64 per cent to Miss *T*'s pupils and an average of 66 per cent to her own pupils. Miss *T* gave an average grade of 69 per cent to her own pupils and an average of 62 per cent to Miss *Z*'s pupils. Each graded her own pupils higher.

6. Grading an essay. An interesting story of the unreliability of teachers' estimates of the written work of students is that of a recent scholarship contest for the best essay on "How Can America Stay Out of War?" The contest was announced over the radio by Eddie Cantor, broadcasting a tooth paste advertisement. A high school boy copied and sent in an essay he found in the *Peace Digest* for December, 1935, originally written by President Frank Kingdon, of the University of Newark. The boy said that he had shown the essay to his teachers and they had pronounced it "only fair." Four famous, but busy, college presidents examined the best of 212,200 essays and pronounced it the winner, though they failed to discover the plagiarism.

7. Grading examinations in England. Recently all England has been stirred by an investigation of the English Committee of the International Institute Examinations Enquiry published by Hartog and Rhodes.[7] The major public examinations of Great Britain are conducted with scrupulous fairness and sincere efforts to arrive at an accurate measure of the achievements of candidates. This investigation showed, however, that experts in reading examinations cannot agree on the value of a written paper. In one study, fifteen history examinations which were originally considered to be of equal value, when regraded by other readers, received marks varying from 21 to 70 out of a possible 96. Much more interesting and suggestive is the fact that when 14 of the original examiners regraded the same history paper after an interval of a year or more, their marks differed from those they had previously given, the difference in one case being as great as 30 points. One set of Latin papers received 24 different marks, ranging from 28 to 55. In an examination in English for a school certificate, of 39 candidates who had been

_____
[7] Hartog, Sir Philip, and Rhodes, Dr. E. C., *Examining the Examinations*, The Macmillan Company, Ltd., London, 1935. See also: The Carnegie Foundation, *Conference on Examinations*, Vol. I, 1931, and Vol. II, 1936, Bureau of Publications, Teachers College, Columbia University, New York City.

marked failures by one or more examiners, 24 were given a passing credit, 8 a special credit, and 3 a credit of distinction by one or more of the examiners.

8. Conclusions. It is apparent from these studies that teachers cannot agree on the value of a written examination in almost any elementary or high school subject. Grading a traditional or essay type of examination is highly subjective and inaccurate.

III. The Unreliability of School Marks

If teachers cannot agree on the value of a written paper, it is very probable that they would disagree on a monthly or semester grade. Undoubtedly, most school marks are highly subjective and inaccurate. Any teacher who has given school marks on a subjective basis knows that a great deal depends upon the person giving the marks.

1. Unreliability of school marks. A number of studies have been reported by Johnson,[8] Kelly,[9] Hendrickson,[10] Miles,[11] and Dearborn[12] showing great variability in school marks by different teachers. In some schools certain teachers will give no failures and other teachers will fail many. The wide variation in grades has never been explained by the differences in abilities of children, but largely by the different concepts teachers have of different grades.

A study by Johnson[13] shows that a child has almost three times the chance of getting an A in Latin or Greek that he has of getting one in English. English teachers fail nearly three times as many pupils as do domestic science teachers. Two teachers in the same department gave 7.5 per cent F and 7.2 per cent A, and 35.7 per cent A and 4.5 per cent F, respectively.

---

[8] Johnson, F. W., "A Study of High School Grades," *School Review*, Vol. XIX (January, 1911), pp. 13–24.

[9] Kelly, F. J., *Teachers' Marks, Their Variability and Standardization, Teachers College Contributions to Education*, No. 66, New York, Bureau of Publications, Teachers College, Columbia University, 1914.

[10] Hendrickson, Carl E., "School Marks, The Van Nuys High School," *Educational Research Bulletin*, Los Angeles City Schools, Vol. VII (December, 1927), pp. 8–9.

[11] Miles, W. R., *Comparison of Elementary and High School Grades, University of Iowa Studies in Education*, Vol. I, No. 1.

[12] Dearborn, W. F., "School and University Grades," *University of Wisconsin Bulletin*, No. 368, High School Series No. 9 (June, 1910).

[13] Johnson, F. W., *op. cit.*, 1911.

Trabue[14] found, in a study of marks given during one semester in five of the large high schools in New Jersey, that in two schools only 8 per cent of the marks indicated failure, while the failure in the third school was 12 per cent, in the fourth school 14 per cent, and in the fifth school 27 per cent. He is of the opinion that the difference between 8 per cent and 27 per cent of failure marks was not due to the difference in the general character of the schools, and that probably it was not caused by the differences in the abilities of the students. The only plausible reason for the wide variation in the percentage of failures is a difference in the opinion as to what constitutes failure. Finkelstein[15] has shown the effect on teachers' marks of the same pupils when one teacher had charge of the first semester and another teacher had charge of the second semester in a course extending over a year. The instructor in the first semester exempted from examinations 12.5 per cent of the class, while the instructor for the second semester exempted 37.5 per cent.

Many investigators have noticed special differences of teachers in grading, that is, that one teacher consistently grades high and another teacher grades low. Thorndike[16] noticed this phenomenon and used the expression "halo" for identifying it. He said, "The magnitude of the constant error of the halo, as we have called it, also seems surprisingly large, though we lack objective criteria by which to determine its exact size." In comparing the marks assigned by all teachers in two high schools, the writer found that in one school most of the pupils received grades of 86 to 100 while in another they received grades of 70 to 85. It is obvious that one school grades high and the other grades low.

2. Variability of school marks in one school. In a survey of the City of Bartlesville, Oklahoma, in 1929, the author[17] found the following percentages of failures in the elementary school: Grade I, 19.51; Grade II, 5.08; Grade III, 2.99; Grade IV, 1.07; Grade V, 6.90; Grade VI, 4.53. The variability in the per-

---

[14] Trabue, Marion R., *Measuring Results in Education*, New York, American Book Company, 1924, pp. 43–51.

[15] Finkelstein, I. E., "The Marking System in Theory and Practise," *Educational Psychology Monographs*, No. 10, Baltimore, Warwick and York, 1913.

[16] Thorndike, Edward L., "A Constant Error in Psychological Ratings," *Journal of Applied Psychology*, Vol. IV (March, 1920), pp. 25–29.

[17] Collins, Ellsworth, *et al.*, *Report of Bartlesville Survey*, mimeographed ed., Norman, Okla., College of Education, University of Oklahoma, 1929.

centage of high school failures in some subjects is shown by the following: physics, 0; Virgil, 0; clothing, 0; plane geometry, 4.06; American history, 5.09; beginning Latin, 5.97; world history, 6.97; chemistry, 8.06; English I, 8.71; Shorthand I, 10.08; Spanish I, 11.76; commercial law, 14.07; commercial arithmetic, 17.07.   One is prone to ask why more children should fail in one subject than in another if the work is adjusted to the level at which it is taught.   However, disagreements in the percentage of failures are found in almost every school at all levels of learning from first grade through college.

3. Disagreement on meaning of "failure" in objective tests. Rinsland[18] showed that objective examinations in history and literature (with keys of answers furnished to teachers) could be scored uniformly in points; but that when teachers converted these scores into grades, they did not agree.   Several illustrations are very striking.   In English literature F was given by one school at 20 points, by another at 30 points, and by another at 40 points; and one school gave a $B-$ at 41 points.   In American literature one school placed the highest F at 61 points, while another school made 60 points an A.   In American history one school gave A at 100 points and failed at 46 points; another school gave A at 84 points and failed at 30 points; and still another school gave A at 77 points and failed at 36 points.

4. Effect of rigid application of a 75 per cent failure line. The author, when working in a city school system in Oklahoma, had the teachers send in questions in Oklahoma history for a final examination.   This had been the policy in that school system for a number of years.   The author made these questions into objective form and mimeographed the test and the key of answers and had all papers scored by all the teachers concerned. Where two teachers, by independent scoring, differed one or two points, two school principals rescored the papers until all agreed within, at least, one point.   The perfect score was 47 points and the failure line of the school had for years been 75 per cent. Therefore, a failure line was drawn between the scores of 37 and 35.   The number of pupils failing was 143 and the number passing was only 61.   This, of course, was an astonishingly large number of failures.

The teachers disagreed greatly on the cause of this condition. Some blamed it on the pupils, some on the teachers, and some

---

[18] Rinsland, Martha O'Daniel, *The Use of Objective Examinations as Semester Examinations*, unpublished master's thesis, University of Oklahoma, 1926.

on the books. But the real cause was the fact that 75 per cent *probably had never* been the real failure line. Pupils had not mastered 75 per cent of the items on the test. Teachers merely believed that they could teach *most* of their subject to *most* pupils, and the lowest passing they just marked *arbitrarily* 75 per cent, with a resulting gross inaccuracy. When answers of pupils were accurately counted, with almost no disagreement among teachers, and the 75 per cent failure line applied, teachers actually found that they would fail more than they would pass.

This experiment was repeated in the same schools in 1923 with a longer examination. This year the 75 per cent line would have failed 166 pupils and passed only 110!

Three studies in three subjects show that 75 per cent has *not* been the failure line in three subjects. McKeown[19] showed that the average student in first-year algebra was getting only 54 per cent of all the items tested. She tested 300 pupils in five schools by objective examinations constructed for every chapter of the state-adopted text and also by mid-year and final examinations. She says that the failure line is at 23 per cent. Hunt,[20] using objective weekly exercises and measuring everything studied in the state textbook in language and grammar, found the average grade for four grades to be as follows: Grade III, 57 per cent; Grade IV, 52 per cent; Grade V, 61 per cent; and Grade VI, 57 per cent. He says that the failure line is about 23 per cent. House,[21] measuring by objective practice exercises every unit in high school chemistry in three schools, found that the average correct responses of 120 students were only 54 per cent of the material presented. He concluded that the average failing student learned only 25 per cent of the material presented.

These data show conclusively that teachers *cannot* accurately apply a percentage system, and that no one knows what a failure line is in terms of percentage. Giving numbers to our subjective judgment does not make our judgment more accurate. Even when teachers can all agree on the number of correct points in an examination paper, they *cannot* agree on grades. When one school will give an *F* to an objective examination having 61 correct answers and another school will give an *A* to the same

[19] McKeown, Kate, *The Amount of Learning in First Year Algebra*, unpublished master's thesis, University of Oklahoma, 1927.

[20] Hunt, Shay, *A Measure of Learning Language in Intermediate Grades*, unpublished master's thesis, University of Oklahoma, 1932.

[21] House, Otis W., *A Measure of the Amount of Learning in High School Chemistry*, unpublished master's thesis, University of Oklahoma, 1934.

printed examination having 60 correct answers, it *must* be con-cluded that such a grading system is practically worthless, or, at least, highly inaccurate.

As a matter of fact, teachers cannot agree on what 0 per cent is (just not any knowledge in a subject at all) nor can they agree on what 100 per cent is. Further, it has been shown that teach-ers cannot agree on any percentage value in several subjects. Therefore, it *must* be concluded that the 100 per cent grading scale, as a measuring rod, hardly exists or is so inaccurate as to be almost worthless.

5. Reasons for disagreements of grades. There are a num-ber of reasons why teachers differ so greatly in estimating the value of students' work. First of all, teachers do not agree on what to count and on how many points or what weights to give the things they do count. In grading a paper in English com-position, some teachers are influenced by handwriting, some are particularly influenced by spelling, some are influenced by grammatical errors which are particularly distasteful to teachers, and some teachers are not good judges of style, quality, or rhetoric. Again, teachers have different standards of severity or leniency, and even the same teachers have different standards on different occasions. Fatigue seriously affects grading of papers and tends to lower the grade given. Some teachers permit the estimate of personality, effort, and industry to enter into the measurement of school achievement. These factors should not be mixed with actual achievement. As will be pointed out in a later chapter, they should be measured separately from achievement. When all is said and all studies examined, one is forced to admit that both the grading of an individual examination paper and the whole grading system are highly subjective, unreliable, and unfair. Pupils who should pass are failed, and pupils who should fail are passed. Subjective judg-ment has been replaced in most of the scientific evaluations of nature and should be replaced in the scientific evaluation of human nature.

Not only have teachers questioned the accuracy of examina-tions and grades, but pupils express grave doubts as to their accuracy and fairness. Barton[22] submitted a questionnaire to 1,513 pupils to find their opinion regarding a number of things about marks. Fifty per cent of the students believed that

[22] Barton, W. A., "Pupils' Opinions Regarding the Reliability of Marks," *School Review*, Vol. XXXIII, 1925, pp. 733–778.

marks were a fair estimate of what they had done and 50 per cent believed that they were not a fair estimate. Fifty-five per cent of students do not get the highest marks in subjects in which they study hardest. Thirty-seven per cent believe that the giving of low marks the first month is a bluff. Grading should be fair, impartial, impersonal, uniform, and comprehensible to the student.

6. **Conclusion.** It must be concluded, therefore, that there are two serious errors in our examination and grading system. First, subjective or essay examinations are inaccurate: they present too much of a teacher's personal judgment and not an impartial measurement. Second, our grading system is grossly in error, and in many subjects we have not been passing at 70 per cent or 75 per cent. Both testing and grading must be improved in accuracy.

IV. The Purpose of Examinations

1. **Measurements.** If improvement of measuring instruments is a mark of science, and accuracy of knowledge has improved physical well-being, certainly accuracy in the measurement of school products could be used to improve the learning of children and the organization of the school. In all phases of life measurements are increasing, not decreasing. When measurements in school become more accurate and are used solely for better understanding boys and girls, then examinations will not be feared by pupils nor called "necessary evils" by teachers, school executives, and parents. Pupils like to be informed of their school achievement just as men and women like to be informed of their occupational achievement. Where people are selected because of special fitness or education, this selection will have to be done by some form of examination, and the selection will be just as fair as the examinations are fair and reliable. Many writers in economic and social life are recommending the extension of civil service examinations, and many children now in school will take these examinations for the increasing number of vocations open only by examination. It is certainly wise to prepare students for these types of examinations by examinations in school. Educational, and later vocational, guidance can be accomplished only through more accurate measurements of what children have learned and what abilities they possess. Predicting the success of a pupil is the essence of educational science, but science demands reliable and

accurate measurements. When these things are considered, many of the objections to examinations and school marks will be removed.

If accurate instruments measuring what children learn can be designed, then an accurate system of grading and a sensible plan of reporting children's progress to parents can be established. Equally important for the school is a detailed analysis of what the child is learning. The school situation is similar to the hospital situation. The relatives of a sick person will receive somewhat general reports about his condition (such as "improving," "not so well," or "getting along fairly well"), but the medical men in charge want the most accurate and minute measurement of every change in the patient. Many of these measurements are highly technical and could not be understood by relatives. The same situation now exists in progressive schools. A new measure of progressive education comprises not only a wholesome and sane philosophy for this age of changing social and economic conditions, but also a system of measurements and interpretations by which boys and girls and their learnings are better understood. Carrel[23] expresses the same idea with broader implications when he says, "The only possible remedy of the evils of modern civilization is a much more profound knowledge of ourselves," and " . . . the science of man has become the most necessary of all."

2. Motivation. Examinations are used for motivation. Ruch[24] as early as 1924 pointed out the use of an examination as a device for motivation. There is nothing wrong in this. Examinations can be used as incentives for children to study just as rewards and promotions are used as incentives for adults. Educators are always seeking motivating stimuli. The writer has heard prominent educators decry the use of examinations, yet the same speakers have been the organizers of honorary clubs! Obviously, these clubs were organized to motivate and recognize learning. Good examinations are also being used as devices for proper motivation. Too often, examinations are used as punishment instruments, instruments of torture. The popular plan is to exempt the good students from an examination; that is, to reward them by not measuring them to find out

---

[23] Carrel, Alexis, *Man, the Unknown*, New York, Harper and Brothers, 1935, pp. 28–29.

[24] Ruch, G. M., *The Improvement of the Written Examination*, Chicago, Scott, Foresman and Company, 1924, pp. 3–6.

how good they are. We guess at their goodness and punish the other children by measuring their goodness. Bright children need to be measured as well as dull children. Life is full of motives; therefore, it is not wrong to have an examination as a motive. Pupils measure their instructors and instructors measure their pupils. When one applies for a job, he is measured. The banker measures the man who applies for a loan, and the man who deposits money in the bank measures the banker so that he may place his money in a bank he considers safe. Since every phase of life measures and has motives, it is not wrong to duplicate such a situation in the school. The objection to examinations as motivating instruments has come from those who knew that examinations were unreliable and invalid.

Probably the teacher should not place the emphasis on examination day as a "day of reckoning," but should emphasize instead the use of examinations as instruments of help to the pupils. Pupils should not be fearful or lose their emotional stability when confronted with an examination any more than they should when faced with a physical examination. Teachers have taught these fears. The wide fear of examinations is not a condemnation of the examination, but a condemnation of the teacher who is lacking in knowledge of the examination and of children's personalities. Historically, the objective tests were first published by experts in the field of measurement and were highly standardized. Later, the objective forms of these tests were recommended for the use of classroom teachers. It is now possible for classroom teachers, or a committee of such teachers, to build very reliable and useful objective tests for analyzing and diagnosing children's learnings in the different school subjects and for building a more reliable semester grade. The following chapters deal with the actual construction of these tests and examinations. Their advantages and disadvantages will be discussed after their construction has been studied.

V. The Criteria of a Good Examination

1. **Validity.** The first important question about any measuring instrument is its validity, or what the instrument measures. Very often the physical appearance of a measuring instrument gives no index as to what it measures. This is true of measuring instruments in the physical world as well as in the mental world. *Validity* is often defined as the property of a measuring instrument to measure what it purports to measure. If the score or

grade given a geometry paper was heavily influenced or weighted by the quality of drawing and handwriting, the score or grade would not be highly valid.   If handwriting influenced the grade given an English composition, the grade would not be valid. Validity is a measure of the purity of the thing one intends to measure.   Validity, then, is one of the chief characteristics of a useful measuring instrument.   It is the first important fact to be known about a measuring instrument.   If teachers can build unadulterated and pure tests of the different things learned by children, then they will be able to diagnose difficulties and to determine what is learned, what is not learned, or the extent to which certain things are learned.   With tests of this type, teachers can be a help to pupils and pupils will realize that this is the purpose of tests.   Then tests will not be feared, but appreciated.

2. Reliability.   The second important question about a test is the consistency or accuracy with which a test measures what it does measure.   Many illustrations of the lack of reliability have already been given.   As will later be pointed out, there are actually present in grading papers by personal opinion many factors for which there are no external controls such as there are in rule-books for scoring athletic contests.

3. Other factors influencing the value of a test.   There are many other factors which make a test a good measuring instrument or a good examination.   Such factors are difficulty, ease of administration, ease and rapidity of scoring, uniformity of administering and scoring, and uniformity and consistency in interpreting scores and standards of achievement, or norms, by which passing, failing, and other degrees of scholarship are determined.

Validity, reliability, difficulty, norms, and scoring devices are rather technical and often statistical.   They will be treated in detail in a later chapter.   The general conception of the meaning of "reliability" and "validity" is, however, of first importance in building or evaluating any test.   Throughout the discussion of the book, these terms will be used from both philosophical and statistical viewpoints.

VI. The Objective Forms of Tests

Science has made its greatest progress through the invention and the use of objective instruments.   An objective measuring instrument yields similar, or nearly identical, scores, or units of

measurement, in the hands of all competent users.   In education an objective test should yield practically the same scores in the hands of all teachers.   To the degree that the test is objective, to that degree the scores secured by competent users are the same.   To the degree that the test is subjective, to that degree the scores secured by competent users are different.   All measuring instruments vary in objectivity on a scale from *zero objectivity*, which is perfect subjectivity, or pure guess, to *one*, which is perfect objectivity, perfect prediction, or perfect agreement by all competent judges.   Of course, no measuring instrument which has perfect objectivity has been built.   In the measurement of physical objects, science approaches perfect objectivity.   Since objectivity is the chief factor contributing to the reliability of measuring instruments, the objective test is more reliable than the subjective test.   The objective test is now more widely used than it was a few years ago, and it has helped to put educational procedure on a more scientific (impersonal and objective) basis.

In general structure, the objective test consists of simple statements and shorter answers than the essay or subjective test.   It samples in more detail than the subjective test.   The subjective test samples more intensively: one question calls for many details and relations.   The objective test either uses a separate question or item for each part of information or relation, or calls for a simple answer, such as "Yes" or "No," for a long line of thinking or reasoning.   Both subjective and objective tests are natural forms.   Many of life's big questions are answered only in complete books or even volumes, while many other great problems involving much thought, with many facts and many attitudes, yield only one of two answers—a "Yes" or a "No"—the form of the answer of the true-false form of objective test.   We may say, in general, that the subjective test samples intensively and the objective test samples extensively.   Both forms of sampling are necessary for complete educational measurement of all forms of learnings.

There are many forms of objective tests.   One of the earliest used by teachers and still one of the most widely known is called the *true-false* test.   McCall,[25] as early as 1920, called attention to the value of the true-false examination as an objective and reliable measuring instrument, widely used in psychological and

[25] McCall, William A., "A New Kind of School Examination," *Journal of Educational Research*, Vol. I (January, 1920). pp. 33–46.

standardized tests, which could well be used by the classroom teacher. He estimated that 36,000,000 hours were annually spent in examining pupils, and that the time saved and improvement made by the new technique of scientific testing should be made available to all. Examining pupils is a necessary division of the teaching process. If objective tests can save time and improve accuracy, they should be known to the classroom teachers.

The many forms of objective tests have many names. Authorities do not agree on the names of the different objective forms. Many forms have no special name. Ruch[26] gives 16 different names for objective forms, and some of these have as many as 7 subheadings; but Conneau[27] states that about 90 per cent of these forms are the Completion, True-False, Multiple-Response, Matching, and Identification forms. In the following chapter will be presented descriptions, rules for building, and samples of Multiple-Choice, Simple Recall, Sentence Completion, Matching, Alternative Response, and a group under the heading of Miscellaneous Forms. The miscellaneous forms include many forms given different names by different writers, a combination of the forms just named, and a number of original or new forms which are not named and are presented for the first time. Samples are given in almost all elementary and high school subjects and are arranged in alphabetical order. Since it is impossible to present samples of every available objective form in every subject, and many objective forms are equally applicable in many subjects, the teacher should examine samples of objective tests in subjects other than the one or ones he teaches. The elementary teacher should examine samples of objective forms in high school subjects, and the high school teacher should examine samples of objective forms in elementary school subjects. Many variations of the objective forms here presented are possible. The teacher should be encouraged to design new forms and variations to suit the subject and types of responses, or conducts, to be tested. Many of the miscellaneous forms, which are original, will suggest variations to the teacher who cares to experiment in test structure.

---

[26] Ruch, G. M., *The Objective or New-Type Examination*, Chicago, Scott, Foresman and Company, 1929.

[27] Conneau, A., *Tendencies in Objective Testing in High-School Subjects as Shown by Analysis of a Representative Sampling of Such Tests*, unpublished M. A. thesis, University of California, 1928.

Selected List of Books with References on the Unreliability of Grading and Grading Systems[28]

Ellis, Robert S., *Standardizing Teachers' Examinations*, Bloomington, Ill., Public School Publishing Company, 1927, Chap. V, "Converting Scores Into Grades," pp. 91–118.

Greene, Harry A., and Jorgensen, Albert N., *The Use and Interpretation of Elementary School Tests*, New York, Longmans, Green and Company, 1935, pp. 185 and 490–494.

————, *The Use and Interpretation of High School Tests*, New York, Longmans, Green and Company, 1936, pp. 182–185 and 566–571.

Gregory, Chester A., *Fundamentals of Educational Measurement with the Elements of Statistical Method*, New York, D. Appleton-Century Company, 1923, pp. 156–159.

Lang, Albert R., *Modern Methods in Written Examinations*, Boston, Houghton Mifflin Company, 1930, Chap. XI, "Changing Test Scores Into Grades," pp. 246–270 and 288–290.

Lee, J. Murray, *A Guide to Measurement in Secondary Schools*, D. Appleton-Century Company, 1936, Chap. VII, "The Use of Measurements in Marking," pp. 226–265.

Lincoln, Edward A., and Workman, Linwood L., *Testing and the Uses of Test Results*, New York, The Macmillan Company, 1935, pp. 4–7.

Monroe, W. S., De Voss, J. C., and Kelly, F. J., *Educational Tests and Measurements*, rev. ed., Boston, Houghton, Mifflin Company, 1924.

Newkirk, Louis V., and Greene, Harry A., *Tests and Measurements in Industrial Education*, New York, John Wiley & Sons, Inc., 1935, pp. 207–209 and 235–239.

Odell, C. W., *Educational Measurement in High School*, New York, D. Appleton-Century Company, 1930, Chap. XIX, "School Marks," pp. 458–470.

Ruch, G. M., *The Improvement of the Written Examination*, Chicago, Scott, Foresman and Company, 1924, Chap. III, "Sources of Error in Written Examinations," pp. 40–64.

————, *The Objective or New-Type Examination*, Chicago, Scott, Foresman and Company, 1929, Chap. XIV, "Examinations, Marks, and Marking Systems," pp. 369–402.

Russell, Charles, *Classroom Tests*, Boston, Ginn and Company, 1926, pp. 303–314.

Smith, Henry Lester, and Wright, Wendell William, *Tests and Measurements*, Newark, N.J., Silver, Burdett Company, 1928, Chap. II, "Measuring and Reporting Achievement," pp. 11–29.

Starch, Daniel, *Educational Psychology*, New York, The Macmillan Company, 1928, Chap. XXIII, "Marks and Measures of School Work," pp. 512–536.

---

[28] A number of references in the footnotes are in addition to references in this list.

CHAPTER II

Multiple Choice[1]

Definition. A *multiple-choice* item is defined as an ·objective form in which a statement or question is given with more than two completions, choices, or answers, only one of which is correct. When the item is in the form of a statement, the different completions of the statement usually come at the end of the statement, although the different completion statements or words may be anywhere in the sentence. The whole item when correct must make complete sense and be correct in its information.

I. Rules for Constructing Multiple-Choice Items

1. Be sure to use four or five choices in each item. If ideas or items do not lend themselves to about five choices, omit them or change them to test a slightly different phase of the same point. Four choices are satisfactory to Grade Five; five choices are preferable from Grade Five up.

POOR: The work of the motor nerves is   1 to carry messages in from the muscles to the brain   2 to carry messages out from the brain to the muscles.

BETTER: To carry messages out to the muscles and cause them to move is the work of   1 the sensory nerves   2 the motor nerves   3 the spinal cord   4 the medulla   5 the optic nerve.

POOR: The act of hanging up a picture is classed as   1 an involuntary action   2 a voluntary action.

BETTER: Of the following, the voluntary action is   1 beating of the heart   2 hanging of a picture   3 blinking of the eyes   4 drawing of the finger away from a hot stove   5 breathing.

2. Use choices which might be plausible answers; if obviously silly choices are included, the real thinking situation is reduced to only two or three choices.

---

[1] A list of references to books on building objective tests is given at the end of Chapter VII.

POOR: The first President of the United States was 1 John Adams 2 Jack Dempsey 3 George Washington 4 Rudolph Valentino 5 Calvin Coolidge.

BETTER: The first President of the United States was 1 John Adams 2 James Madison 3 Thomas Jefferson 4 George Washington 5 Andrew Jackson.

3. Be sure that each choice is in the same grammatical form as the main part of the question and makes complete grammatical sense when read alone with it.

POOR: The advantage in having the bones of the foot arranged in the form of an arch is to 1 make the foot look better 2 make the foot look larger 3 for the greatest strength 4 for making the foot look smaller 5 making us different from monkeys.

BETTER: The advantage in having the bones of the foot arranged in the form of an arch is 1 to make the foot look better 2 to make the foot look larger 3 to secure greatest strength 4 to make the foot look smaller 5 to make us different from monkeys.

4. Be sure that only one of the choices is correct, according to every possible interpretation, all authorities, and date.

POOR: Russia's backwardness in trade is due to 1 uneducated people 2 inefficient government 3 poorly located ports 4 lack of transportation facilities 5 lack of mineral deposits.

BETTER: Russia's backwardness in trade is due to 1 its density of population 2 the extremely cold climate 3 the poor farming land 4 lack of transportation facilities 5 lack of mineral deposits.

5. Do not try to test points acknowledged to be disputed by authorities or points varying from time to time unless time or authority is stated.

POOR: The largest city in Oklahoma is 1 Tulsa 2 Oklahoma City 3 Muskogee 4 Bartlesville 5 Enid.

BETTER: According to the 1930 Census, the largest city in Oklahoma is 1 Tulsa 2 Oklahoma City 3 Muskogee 4 Bartlesville 5 Enid.

POOR: The teeth should be brushed   1 once a day   2 twice a
    day   3 three times a day   4 before each meal and before
    going to bed   5 with soda or salt at least once a week.
BETTER: If the teeth could be brushed only once a day, the most useful
    time to do it would be   (1) just before breakfast   (2) just
    after lunch   (3) 10:00 A.M.   (4) 2:00 P.M.   (5) just
    before going to bed.

6. Avoid wording questions and choices so that the answer
is perfectly obvious.   The question should be a test of subject
matter and not one of just common sense.

POOR: The boy whom an employer would be more apt to hire for a
    position is one who   1 is clean, neat, and stands erect   2 has
    dirty hands and fingernails   3 slouches along with his hands
    in his pockets when he walks   4 is ill-mannered and impolite
    5 never combs his hair or brushes his teeth.

7. Word questions definitely both in the first part of the
statement and in the five choices.

POOR: The Great Lowland Plain of Europe is valuable for its   1
    minerals   2 agriculture   3 commerce   4 scenery   5
    fine harbors.
BETTER: The chief value of the Great Lowland Plain of Europe is in its
    1 mineral   deposits   2 agriculture   3 commerce,   AND SO
    FORTH.
POOR: The difference between the surface features of Europe and
    North America is   1 mountains are higher in Europe   2
    scenery in the United States more beautiful   3 the greater
    highland and plain extend in an east-west direction   4 rivers
    are longer in United States   5 lakes are larger in Europe.
BETTER: The chief difference between the surface features of Europe
    and North America is that   1 the area of Europe is larger
    2 Europe extends more to the south   3 the greater highland and
    plain of Europe extend in an east-west direction   4 the Volga
    River is longer than the Missouri-Mississippi   5 the lakes in
    Europe are larger.

8. Word questions in the simplest possible manner.

POOR: If an epidemic of typhoid fever should occur, the first thing the
    health officers would be likely to examine in their search for the

source of the disease is the   1 food supply   2 stores   3 water supply   4 bakeries.

BETTER: The most common source of typhoid fever epidemics is 1 exposed food supply   2 unsanitary stores   3 impure water supply   4 unclean bakeries   5 lack of vaccines.

9. Do not give away the answer to one question by the wording of the next question.

As: The only state which failed to send delegates to the Federal Convention of 1787 was   1 Maryland   2 Massachusetts   3 Rhode Island   4 North Carolina   5 Virginia.

FOLLOWED BY: The reason Rhode Island failed to send delegates to the Federal Convention of 1787 was   1 AND SO FORTH.

10. Where possible, keep the choices short. Where it does not alter the point being tested to do so, long, wordy choices can be avoided by transposing the question.

As: Marseille is   1 the largest city in France   2 the second largest city in Europe   3 the leading port of France   4 the port through which almost all English and American trade enters France   5 the wine center of France.

TRANSPOSED: The leading port of France is   1 Bordeaux   2 LeHavre   3 Marseille   4 Nice   5 Paris.

11. Avoid the use of *a* or *an* as the final word before the listing of the choices, as these words are definite clues to the correct answer. If all choices do not go with one or the other of these articles, place the proper article at the beginning of each choice.

POOR: The starfish is an   1 insect   2 sponge   3 echinoderm   4 protozoan   5 coelenterate.

BETTER: The starfish is   1 an insect   2 a sponge   3 an echinoderm   4 a protozoan   5 a coelenterate.

12. Rules for mechanical form.

12.1 Make the first, second, third, and following choices the correct response in about equal numbers. Do not allow the correct response to occur in the same position for more than two or three successive items, and do not allow a regular cycle.

12.2 Keep parentheses in a perfect line at the right or left side of page. Do not let the typing of items overlap the vertical space or column of the parentheses.

12.3 Single-space within an item; double-space between items. Where it is desired to get the largest number of items on a page, single-space throughout.

12.4 Parentheses around the numbers of the choices are not necessary unless responses are numerals, as in arithmetic and algebra.

12.5 Use no punctuation between choices; simply skip *3* spaces.

12.6 At the end of the item choices, use the correct punctuation mark.

12.7 Parentheses for answers should be placed in a column on the left side of the page. Students prefer this form because of the proximity of question and answer—promoting speed in answering and rechecking their papers. Teachers prefer it because it eliminates the additional work and time of typing dashes from the end of the sentence to the parentheses. If parentheses are placed to the left in all recognition forms (multiple choice, matching, alternative response, and others), several forms may be used on one page with all answers in one column.

13. Rules for keys of answers.

13.1 Keys of answers should be in a straight line, spaced exactly the same down the page as the test items.

13.2 When a test has several pages, the key may be all on one page, the page divided into columns for the pages, and each column marked for the correct page, exercise, or whatever the division of the test.

13.3 Keys should be written at the same time test items are written.

14. Rules for writing directions to students. Make the directions to the pupils clear and distinct. Directions for pupils should always state two things: first, what is given; second, what the student is to do (this usually includes instructions as to where the answer is to be placed). These directions are to be placed at the beginning of an exercise of multiple-choice items. The directions below are worded for a five-choice item having the responses placed in front of the statement. The following directions are clear to all pupils in and above Grade Three:

Directions. Below are given a number of statements each followed by five words or phrases, only one of which is correct. Find the one that completes the statement and makes it true and place its number in the parenthesis in front of the statement.

15. Rule for scoring. Count each correct response one point.

16. Usually, one correct choice is placed with several incorrect choices, as mentioned in item 4. But it is possible to have a number of correct forms and only one incorrect form. This form often appears in a measure of English usage. An illustration of this is given under sample 3.2, English usage, page 26.

II. Samples of Multiple Choice in Elementary School Subjects

1. Arithmetic.

1. ( ) The Roman numerals for 1933 are   1 MCXIII   2 MCMXXXIII   3 CCMXIXIII   4 CXIII   5 MCIII.
2. ( ) If a cow eats 16 lbs. of hay a day, how long will 120 lbs. feed her?   (1) 12 days   (2) 16 days   (3) 120 days   (4) $4\frac{1}{4}$ days   (5) $7\frac{1}{2}$ days.
3. ( ) An example of division is   (1) $3 + 6$ (2) $18 - 14$ (3) $11 \div 3$ (4) 33×55 (5) $2 - 1 \times 6$.
4. ( ) The example $56\overline{)3589}$ would be solved by   1 addition   2 division   3 multiplication   4 subtraction   5 square root.
5. ( ) Which is cheapest to send by telegraph?   1 a night letter   2 a day letter   3 a day telegram   4 a night telegram   5 a cablegram.
6. ( ) One should send a check by   1 first-class mail   2 express   3 freight   4 parcel post   5 telegraph.
7. ( ) One should send one-half dozen water tanks $6' \times 3' \times 2'$ by   1 first-class mail   2 express   3 freight   4 parcel post   5 air mail.
8. ( ) Banks usually pay from   (1) 1% to 2% (2) 2% to 5% (3) 6% to 7% (4) 7% to 8% (5) 8% up   on savings accounts.
9. ( ) Interest on savings is usually computed   1 annually   2 semiannually   3 quarterly   4 monthly   5 on daily balance.

A special form of multiple choice in arithmetic making possible an analysis and diagnosis of problem solving is as follows:

Problem. A child with a $2.00 bill was to buy three pencils at 5¢ and a tablet at 10¢. How much would the child have left?

1. (   ) What is given in the problem?   1 A child has lots of money
2 A child has less than two dollars   3 A child is to buy two
dollars' worth of things   4 A child has two dollars to spend
as he wishes   5 A child has two dollars with which to buy
certain things.
2. (   ) What is to be done in this problem?   1 A child has to
bring home two dollars   2 A child has to buy something
and use the rest of the money as he wishes   3 A child has
to buy all the pencils he can with two dollars   4 A child
has to spend all his money   5 A certain amount of change
after making a purchase is to be found.
3. (   ) What processes are to be used in this problem?   1 Addi-
tion and subtraction   2 Addition, subtraction, and multi-
plication   3 Multiplication, addition, and subtraction
4 Multiplication   5 Addition.
4. (   ) What is the probable answer to this problem?   1 $2.00
2 $1.75   3 $25   4 $2.15   5 $.10. (You need not
calculate answer.)

It will be noticed that the following four things are measured
in this kind of test for problem solving: (1) what is given, (2)
what is to be found, (3) the processes to be used, and (4) an
estimate of the answer.   This analyzes the four distinct steps
in any reasoning problem.

Another form of problem-solving analysis is shown on the
opposite page.   This form is really several multiple-choice items
and simple problem solving.   Such combinations of forms are
often included in miscellaneous forms.

2. Art.

1. (   ) John Copley was known as a painter of   1 landscapes
2 portraits   3 figures   4 still life.
2. (   ) The tepee was the work of art of the   1 plainsmen   2
mountain Indians   3 forest Indians   4 five civilized
tribes.
3. (   ) The early Virginians made their homes of   1 timber
2 rocks   3 clay bricks   4 mud.
4. (   ) Whistler signed his paintings with a   1 butterfly   2
rose   3 dove   4 violet.
5. (   ) Augustus Saint-Gaudens sculpture pieces are of   1 chil-
dren   2 men   3 animals   4 women.

Problem	(1) Check the things which are given.	(2) Check the things which are to be found.	(3) Select processes in the order of solution by circling one symbol.	(4) Work the problem here, listing the steps in the order numbered.
1. Helen's father bought a new piano for $975. He paid $275 cash and agreed to pay the balance at $35 per month. How many months will it take him to pay for the piano?	( ) Cost of piano ( ) Amount paid down ( ) Amount paid each month ( ) No. months till it will be completely paid ( ) Balance to be paid	( ) Interest rate ( ) Amount of money paid down ( ) Entire cost of the piano ( ) No. months it will take to completely pay for it	1. $+\ -\ \times\ \div$ 2. $+\ -\ \times\ \div$ 3. $+\ -\ \times\ \div$ 4. $+\ -\ \times\ \div$	1. _____ 2. _____ 3. _____ 4. _____ 5. Final answer _____

3. English.
3.1 English grammar.

1. ( ) The complete predicate is   1 a verb with an auxiliary   2 any verb that makes complete sense   3 the simple predicate when it has a complete subject   4 the simple predicate with modifiers and words that complete its meaning   5 any complete verb phrase.
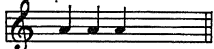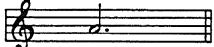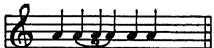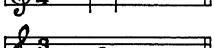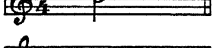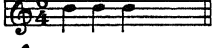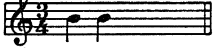
2. (   ) A conjunction is a word that   1 is thrown in   2 connects words or groups of words   3 joins phrases to clauses
4 shows the relation between a word and a group of words
5 shows the relation of the noun or pronoun following it to
some other word.

3. (   ) Which underscored word is a demonstrative pronoun?
1 <u>One</u> wonders why   2 <u>he</u> went.   3 <u>This</u> is the boy
4 <u>whom</u> I recommended.   5 The book <u>that</u> I lost has been
found.

4. (   ) A modifier   1 limits the meaning of the word it modifies
2 takes the place of the word it modifies   3 is a word misplaced   4 is used to indicate the manner of the verb action
5 is used to complete and explain the subject.

5. (   ) From the following sentences pick out one which contains a
mistake in the formation of a plural: 1 The old negroes
were driving some calves through the alleys.   2 Some
Germans are very rich.   3 The shepherds had lost two
of their sheeps.   4 We take long journeys.   5 Boys
play on roofs of barns.

3.2 English usage.

1. (   ) Which of the following greetings of a letter is wrong?
1 Dear Mary   2 My dear Cousin   3 Dear Sir   4
Mary My Dear   5 My very dear Mother.

2. (   ) What punctuation is needed in this sentence?   John said,
Come here.   1 comma   2 period   3 hyphen   4
quotation marks   5 apostrophe.

3. (   ) Which is wrong?   1 We gave it to them.   2 It is they.
3 It belongs to we girls.   4 Send it to us.   5 Please
answer them.

4. (   ) Which word should be capitalized?   1 strut   2 eastward   3 spring   4 bank   5 chicago.

5. (   ) Choose the incorrect sentence: 1 I hurt myself.   2 It
was given to he and I.   3 Your telegram to me is
received.   4 I have a letter addressed to you.   5 The
boy was proud of himself.

6. (   ) Select the incorrectly spelled word: 1 caught   2
scarce   3 guest   4 wellcome   5 fashion.

7. (   ) She invited   1 she and I   2 him and I   3 her and
me   4 she and me   to the party.

8. (   ) My sister is standing by   1 she and them   2 her and
them   3 her and they   4 she and they.

9. (   ) I called everybody except   1 he and her   2 he and she
3 him and her   4 him and she.

10. (   ) My car hit   1 they and she   2 she and them   3 her
and they   4 them and her.

4. Music.

1. (   ) ♩ is called a   1 flat   2 sharp   3 natural   4 note
5 rest.

2. (   ) ♭ is a   1 flat   2 slur   3 hold   4 repeat   5
pause.

3. (   ) 𝄞 is called   1 accent   2 clef   3 measure   4 bar
5 staff.

4. (   ) < means   1 softer   2 pause   3 louder   4 repeat
5 lower.

5. (   ) "*p*" means   1 fast   2 loud   3 smooth   4 soft
5 slow.

6. (   ) An interval is the distance between two   1 rests   2
measures   3 notes   4 tones   5 flats.

7. (   ) *Andante* means to play or sing   1 softly   2 slowly
3 fast   4 with a singing effect   5 loudly.

8. (   ) The time signature in the measure is
1 $\frac{3}{4}$ 2 $\frac{4}{4}$ 3 $\frac{6}{4}$ 4 $\frac{6}{8}$ 5 $\frac{9}{8}$.

9. (   ) The time signature in the measure is
1 $\frac{2}{4}$ 2 $\frac{2}{2}$ 3 C   4 $\frac{12}{8}$ 5 $\frac{3}{4}$.

10. (   ) The time signature in the measure is
1 $\frac{6}{4}$ 2 $\frac{12}{8}$ 3 $\frac{4}{4}$ 4 $\frac{9}{8}$ 5 $\frac{5}{4}$.

11. (   ) The note needed is   1 ♪   2 ♩
3 ♩   4 ♪   5 o .

12. (   ) The note needed is   1 ♩   2 ♩
3 ♪   4 o   5 ♩ .

13. (   ) The note needed is   1 ♩   2 ♩
3 ♪   4 ♩   5 ♪ .

14. (   ) The rest needed is   1 𝄽   2 𝄾
3 ▬   4 ▬   5 𝄾 .

15. (   ) The rest needed is   1 ▬   2 𝄾
3 𝄽   4 𝄾   5 ▬.

5. Physiology.

1. (   ) The tiny plants and animals which cause disease are called
1 plasma   2 microbes   3 toxins   4 vitamins   5
protoplasm.

2. (   ) Germs grow best in   1 cold weather   2 sunlight   3
         high temperatures   4 warm, moist, and dark places   5
         the spring.
3. (   ) Diseases which spread easily and rapidly are called   1
         protozoa   2 immune   3 vigorous   4 circulating   5
         contagious.
4. (   ) Malaria and yellow fever are caused by the bite of a   1
         mad dog   2 mosquito   3 rat   4 fly   5 snake.
5. (   ) Hydrophobia is caused by the bite of the   1 mosquito
         2 rat   3 mad dog   4 fly   5 snake.
6. (   ) The process of heating milk to a temperature of 145 degrees
         (F) and keeping it there for half an hour is called   1 fumi-
         gation   2 disinfection   3 pasteurization   4 steriliza-
         tion   5 vaccination.
7. (   ) The most effective way of exterminating flies is to   1 swat
         them   2 use sticky paper   3 use poison   4 destroy
         all breeding places   5 screen the windows.

6. Reading.
6.1 Reading information, no paragraph to read.

1. (   ) "While there's a right to need my vote,
              A wrong to sweep away,
           Up! clouted knee and ragged coat!
              A man's a man today."
         These four lines refer to   1 a beggar   2 a poor man
         3 a voter   4 a laborer   5 a tramp.
2. (   ) How many years are "four score and seven years"?   (1)
         21   (2) 47   (3) 67   (4) 77   (5) 87.
3. (   ) Whom did Henry Grady mean when he said, "Teach him
         that his house is his own castle and his sovereignty rests
         beneath his hat"?   1 a lord   2 a slave   3 an
         American citizen   4 an Englishman   5 a Mexican.
4. (   ) "Build thee more stately mansions, O my soul,
              As the swift seasons roll!
           Leave thy low-vaulted past!"
         These lines were written by   1 James Russell Lowell   2
         Ralph Waldo Emerson   3 Rudyard Kipling   4 Abra-
         ham Lincoln   5 Oliver W. Holmes.

6.2 Reading with a paragraph to read.   Items based on the paragraph.

Read this paragraph:

"The appearance of Rip, with his long, grizzled beard, his rusty
fowling-piece, his uncouth dress, and an army of women and children

at his heels, soon attracted the attention of the tavern-politicians.
They crowded around him, eyeing him from head to foot with great
curiosity.   The orator bustled up to him, and, drawing him partly
aside, inquired on which side he voted.   Rip stared in vacant stupidity.
Another short but busy little fellow pulled him by the arm, and, rising
on tiptoe, inquired in his ear whether he was a Federal or a Democrat.
A knowing, self-important old gentleman planted himself before Rip
and demanded what brought him to the election with a gun on his
shoulder and a mob at his heels, and whether he meant to start a riot
in the village."

Directions.   Below is given a number of statements based on the
above paragraph, each followed by five words or phrases only one of
which is correct.   Find the word or phrase that completes the state-
ment and makes it true, and place its number in the parenthesis in
front of the statement.

1. (   ) The topic of this paragraph is   1 the appearance of Rip
         Van Winkle on election day   2 Rip had come to vote
         3 Rip formed a mob   4 Rip came with a tavern-poli-
         tician   5 Rip was afraid and carried a gun.
2. (   ) How many points are mentioned in the first sentence
         about Rip's appearance?   1 one   2 two   3 three
         4 four   5 five.
3. (   ) Rip was asked whether he was a Federal or a Democrat by
         1 an army of women   2 the tavern-politician   3 a
         self-important old gentleman   4 an orator   5 a short,
         busy little fellow.
4. (   ) How many persons asked Rip questions?   1 one   2
         two   3 three   4 four   5 five.
5. (   ) Who asked Rip whether he meant to start a riot?   1 an
         old gentleman   2 the orator   3 a little fellow   4
         some women   5 the children.
6. (   ) Rip stared   1 with his long beard   2 with great
         curiosity   3 in vacant stupidity   4 from head to
         foot   5 on tiptoe.

6.3   The following are not based on a paragraph.

7. (   ) The figure of speech contained in
              "Truly the maxim is good, and I do not mean to gainsay it;
              But we must use it discreetly, and not waste powder for
              nothing."
         is   1 a hyperbole   2 an alliteration   3 a personi-
         fication   4 a simile   5 a metaphor.
8. (   ) In the pronunciation of "implacable" the sound of the first
         "a" is   1 long   2 short   3 broad   4 intermedi-
         ate   5 caret.

9. (   ) "God has sifted three kingdoms to find the wheat for this planting" means   1 seed wheat must be carefully chosen 2 wheat was scarce   3 kingdoms were in need of wheat 4 planting is difficult   5 God planted wheat.

10. (   ) Longfellow called "The Courtship of Miles Standish" 1 a historical epic   2 a fairy story   3 a Puritan pastoral   4 an enchanting comedy   5 a humorous study.

11. (   ) Longfellow did not write   1 "The Psalm of Life"   2 "Snowbound"   3 "The   Builders"   4 "Hiawatha" 5 "The Village Blacksmith."

12. (   ) Ichabod's voice was   1 pleasant   2 nasal   3 sweet 4 musical   5 soothing.

13. (   ) "Inveterate propensity" means   1 continued nearness 2 amazing devotion   3 disagreeable incident   4 unfavorable attitude   5 habitual inclination.

14. (   ) The greatest appeal that Irving's works have for us is his power of   1 narration   2 description   3 exposition 4 argumentation   5 declamation.

6.4 Reading vocabulary.

1. (   ) A *luminous* dial is one which is   1 elaborate   2 circular 3 bright   4 obscure.

2. (   ) A *boisterous* group of people is   1 noisy   2 orderly 3 disinterested   4 well organized.

3. (   ) To *originate* something means that you   1 complete it 2 guarantee it   3 understand it   4 begin it.

4. (   ) To be *cautious* means to be   1 obnoxious   2 careful 3 elevated   4 restricted.

5. (   ) When you express *ire*, you express   1 anger   2 contentment   3 quietude   4 fear.

6. (   ) An *installment* is   1 an application for help   2 a complete settlement   3 a partial payment   4 a partnership.

7. (   ) An *anecdote* is   1 a tragedy   2 a historical fact   3 a biography   4 an amusing story.

6.5 Primary reading.

Directions (To be read to the pupils).   Look at the first line, *A*. Read the words.   Can you find the word *see?*   Put your finger on it. Now take your pencil and draw a ring around the word *see*.   (See that every child does this.   Give no further help.)   Look at the next line. Draw a ring around the word *said*.   (Give the same directions for

each line using the correspondingly numbered words in the Key for each line.)

A. so	sit	see	me
1. and	said	some	sing
2. man	and	can	am
3. it	in	is	if
4. ball	boy	toy	big
5.	I am	I can	I will
6.	can run	can find	can see
7.	to play	to go	to run
8.	He is	Here is	He can
9.	to the dog	to the girl	to the pig
10.	a big doll	a big ball	a little doll

KEY OF ANSWERS

1, said; 2, can; 3, it; 4, big; 5, I will; 6, can find; 7, to play; 8, Here is; 9, to the dog; 10, a big ball.

7. Social science.

7.1 Civics.

1. (   ) The name usually applied to taxes collected on imported goods is   1 ad valorem tax   2 income tax   3 tariff   4 inheritance tax   5 property tax.

2. (   ) Money to operate local governments is obtained chiefly from 1 internal revenue   2 tariffs   3 income tax   4 luxury tax   5 real estate tax.

3. (   ) Treason is   1 assassination of a president   2 desertion from the army   3 criticizing the acts of officials   4 betraying the nation to which one belongs   5 failure to pay taxes.

4. (   ) The Nineteenth Amendment   1 gave women the right to vote   2 gave the government right to levy income tax   3 provides for election of senators by direct vote   4 would prevent children from working   5 prohibits the manufacture and sale of intoxicating liquor.

5. (   ) The "Prairie Schooner" was   1 a small ship   2 an early locomotive   3 a motor bus   4 a famous airplane   5 a type of wagon.

6. (   ) In county government the executive power is held by the 1 county treasurer   2 county clerk   3 county judge   4 county superintendent   5 county commissioners.

7. (   ) The law-making body of a state is   1 congress   2 the
        legislature   3 the   corporation   commission   4 the
        supreme court   5 the governor.
8. (   ) Interference with a person's rights by another may be pre-
        vented by   1 extradition   2 subpoena   3 warrant
        4 injunction   5 requisition.
9. (   ) Under the Enabling Act the capital of Oklahoma was   1
        Oklahoma City   2 Guthrie   3 Muskogee   4 Shaw-
        nee   5 Tahlequah.
10. ( ) "Sweat shops" are   1 boiler rooms   2 work rooms
        with many windows   3 small, poorly lighted, and poorly
        ventilated rooms where people work and often eat and sleep
        4 engine rooms   5 factories.

7.2 Geography.

1. (   ) The Erie Canal connects   1 Lake Huron and Lake Erie
        2 the Hudson River and Lake Michigan   3 the Hudson
        River and Lake Erie   4 the Hudson and the Atlantic
        Ocean   5 the Hudson River and New York.
2. (   ) The United States owns   1 Alaska and Hawaii   2
        Canada and Mexico   3 Paraguay and Uruguay   4
        Brazil and Cuba   5 England and France.
3. (   ) The state leading in the production of coal is   1 Okla-
        homa   2 New York   3 Pennsylvania   4 Delaware
        5 New Jersey.
4. (   ) Rice requires a   1 cool, dry season   2 cool, wet season
        3 warm, moist season   4 warm, dry season   5 cool,
        moist season.
5. (   ) The leading port of the Southern States is   1 Galves-
        ton   2 Mobile   3 Ft.   Worth   4 Norfolk   5
        New Orleans.
6. (   ) The highest mountain peak of Colorado is   1 Mt. Ranier
        2 Mt. Logan   3 Mt. Washington   4 Mt. Shasta.
7. (   ) The city with the best harbor is   1 San Francisco   2
        San Diego   3 Los Angeles   4 Portland.
8. (   ) The leading occupations of New Zealand are   1 agricul-
        ture and grazing   2 shipping and commerce   3 lum-
        bering and paper making   4 mining and smelting   5
        fishing and canning.
9. (   ) The broad, low-lying, and generally flat region along the
        Atlantic Ocean is known as the   1 Plateau region   2

Appalachian Highland   3 Delaware River   4 Coastal Plain   5 Gulf Coast.

10. (   ) The state producing the largest amount of oil last year was   1 California   2 Texas   3 Oklahoma   4 Kansas.

11. (   ) Much grazing is done in the Western Plains because   1 there is abundant rainfall   2 the land has been worn out by cultivation   3 there are good cattle markets near   4 it is too dry for cultivated crops.

12. (   ) The principal kind of fish caught along the coast of Washington and Oregon is   1 salmon   2 halibut   3 cod   4 mackerel.

13. (   ) Most shipping in the United States is done by   1 automobile   2 airplane   3 railroad   4 steamboat.

14. (   ) Much fishing is done off the coast of New England because   1 the people enjoy fishing   2 there is good market for fish   3 they have no other occupation   4 fishing is easy work.

15. (   ) The crop requiring the longest growing season is   1 corn   2 wheat   3 cotton   4 oats.

7.3 History.

1. (   ) The first step toward the discovery of America was   1 the travels of Marco Polo   2 the capture of Jerusalem by the Turks   3 the Crusades   4 the invention of printing   5 the invention of the compass.

2. (   ) Marco Polo's book is mainly about   1 Persia   2 Turkey   3 Arabia   4 China and Spice Islands   5 Japan and the East Indies.

3. (   ) Columbus was born in   1 Venice about 1430   2 Genoa about 1446   3 Naples about 1462   4 Florence about 1458   5 Rome about 1456.

4. (   ) When Columbus first sought the help of Ferdinand and Isabella, they would not listen because they were at war with   1 England   2 the Moors   3 Portugal   4 France   5 the Dutch.

5. (   ) Columbus called the people he found Indians because   1 he believed their islands to be near the mainland of India   2 they were copper colored   3 they resembled the people of India   4 they lived in the West Indies   5 they were wild.

6. (′) The chief result of Columbus's discovery was that   1 the Indians were subdued   2 Spain got the first claim to the

New World   3 Columbus was highly honored by Ferdinand and Isabella   4 gold was discovered in America 5 the earth was proved to be round.

7. (   ) The Pacific Ocean was discovered by   1 Cortez   2 Magellan   3 Ponce de Leon   4 De Soto   5 Balboa.

8. (   ) The most powerful Indian tribe in Mexico in 1521 was the   1 Aztecs   2 Montezumas   3 Caribs   4 Iroquois   5 Seminoles.

9. (   ) The first white man to explore Oklahoma was   1 De Soto 2 Cabeza   de   Vaca   3 Cortez   4 Mendoza   5 Coronado.

10. (   ) The English claimed North America because of the voyage of   1 John   Smith   2 Sir   Humphrey   Gilbert   3 Sir   Water   Raleigh   4 Sir   Francis   Drake   5 John Cabot.

11. (   ) The English sailors called themselves   1 "Sea Rovers" 2 "Devil Dogs"   3 "Sea Dogs"   4 "Sea Pirates" 5 "Cavaliers."

12. (   ) The first English settlers were sent to America by   1 Elizabeth   2 Gilbert   3 John   Smith   4 Raleigh 5 Cabot.

13. (   ) The English settlers who founded Jamestown were sent over by   1 the English king   2 Sir Walter Raleigh 3 John Smith   4 the London Company   5 the Plymouth Company.

14. (   ) The last English colony settled was   1 North Carolina 2 New   Jersey   3 Pennsylvania   4 Delaware   5 Georgia.

8. Spelling.
8.1 Spelling with choice of misspelled word.

1. (   ) Select the incorrectly spelled word: 1 serched   2 ladder   3 necessary   4 pupil   5 absence.

2. (   ) Select the incorrectly spelled word: 1 recognise   2 horizon   3 office   4 valley   5 color.

8.2 Spelling with a sentence given and correctly spelled word to be chosen.

1. (   ) Please (   ) a meeting for me.   1 arrange   2 arang 3 arrandge   4 arange   5 arranje.

2. (   ) I have (   ) four letters.   1 writen   2 ritten   3 wridden   4 written   5 writtin.

3. (   ) (   ) for your book.   1 Sirch   2 Serch   3 Search
4 Surch   5 Surtch.
4. (   ) He is a (   ) boy.   1 popular   2 poplar   3 popalar
4 populer   5 pupular.
5. (   ) Show some (   ) in your work.   1 intrest   2 interst
3 interest   4 intreast   5 intirest.

   *8.3 Spelling may also be tested by selection of a correctly
   spelled word from misspellings.*

1. (   ) 1 play   2 pleiy   3 plai   4 pley   5 pla.
2. (   ) 1 topp   2 tup   3 tep   4 top   5 toop.
3. (   ) 1 rin   2 rune   3 ren   4 runn   5 run.
4. (   ) 1 ad   2 add   3 ed   4 edd   5 ada.

III. Samples of Multiple Choice in High School Subjects
1. Art.

1. (   ) Design is a harmonious arrangement used to beautify and
1 decorate an object   2 make an object colorful   3
indicate the method of construction   4 strengthen struc-
ture   5 display artistic taste.
2. (   ) In research for design, it is best to select a plant-life specimen
to show   1 comparison of color   2 texture   3
growth   4 order   5 comparison of values.
3. (   ) The part of a design which carries the movement is called
1 mass   2 dominant   3 background   4 subdomi-
nant   5 harmony.
4. (   ) The space arts are   1 architecture, sculpture, painting
2 music, poetry, dramatics   3 poetry, sculpture, painting
4 sculpture, painting, music   5 architecture, painting,
music.

2. Commercial.

1. (   ) Always space twice after a   1 colon   2 semicolon
3 comma   4 quotation mark   5 dash.
2. (   ) In a classification of accounts, the reserve for bad debts
would be shown as   1 an expense   2 a liability   3
a deduction from Accounts Receivable   4 an income
5 a proprietary item.
3. (   ) The compensation for an injury, awarded by law, is known
as   1 legal tender   2 reward   3 alimony   4
damages   5 legal donation.

4. (   ) Several numbers as parts to be added are called   1 quo-
tients   2 addends   3 factors   4 dividends   5
integrals.

5. (   ) The greeting of a business letter should be followed by   1
a comma   2 a dash   3 a comma and dash   4 a
semicolon   5 a colon.

6. (   ) The monetary basis of the United States is   1 the
bimetallic standard   2 the gold standard   3 the silver
standard   4 the paper standard   5 the commodity
standard.

7. (   ) Always space once after a   1 period   2 dash   3
colon   4 question mark   5 comma.

8. (   ) The proper salutation of a purely business letter is   1
My dear Sir   2 Dear Mrs. Jones   3 Gentlemen   4
My dear Madam   5 My dear Mr. Smith.

9. (   ) A written order by one person on a second person to pay
a third person the amount of money named is called a
1 bill   of   exchange   2 bond   3 draft   4 trade
acceptance.

10. (   ) Transactions involving cash are usually found in the   1
cash book   2 journal   3 ledger   4 purchase jour-
nal   5 sales journal.

11. (   ) The person obligated to pay a trade acceptance is   1
Drawee   2 Payee   3 Promissor   4 Maker.

12. (   ) An act by one person violating another person's private
right is called   1 a crime   2 a misdemeanor   3
felony   4 a tort   5 trespass.

13. (   ) The acquiring of title to all which one's property produces,
either naturally or artificially, is acquisition by: 1
occupancy   2 accession   3 intellectual   labor   4
copyright   5 patent.

14. (   ) A minor becomes of legal age in this state at the age of
(1) 16   (2) 18   (3) 21   (4) 23   (5) 25.

15. (   ) Partners in a partnership known to the public who have
no share in the control are   1 dormant partners   2
normal partners   3 ostensible partners   4 secret part-
ners   5 silent partners.

16. (   ) The legal rate of interest for the State of Oklahoma is
(1) 8%   (2) 9%   (3) 6%   (4) 10%   (5) 12%.

Almost any type of information in typing, bookkeeping, or
commercial law lends itself to multiple choice. All these sub-

jects are not shown separately in multiple-choice form, as the preceding illustrates these.

3. English.

3.1 Literature.

General information about:

Authors—Facts about their lives, their literary style, their literary tendencies, the type of subject matter characteristic of them, and so forth.

Works—Outstanding qualities, plots, historical background, geographical setting, important characters, literary style, literary form, purpose, and so forth.

Literary forms—Definitions, descriptions, works in certain forms, and so forth.

1. (   ) The journey of the Fiery Cross is described in   1 *Ivanhoe* 2 *The Lady of the Lake*   3 *Captains Courageous*   4 *Tam O'Shanter*   5 *The Lay of the Last Minstrel.*

2. (   ) He "wrote like an angel and talked like Poor Poll" was said by Garrick of   1 Goldsmith   2 Pope   3 Addison 4 Swift   5 Steele.

3. (   ) The epitaph:

> Good friend, for Jesus' sake forbear,
> To dig the dust enclosed here;
> Blest be the man that spares these stones,
> And curst be he that moves my bones.

was engraved on the tomb of   1 Keats   2 Chaucer 3 Dickens   4 Byron   5 Shakespeare.

4. (   ) George Eliot was the creator of the   1 picaresque novel 2 historical novel   3 mystery novel   4 psychological novel   5 humanitarian novel.

5. (   ) A contemporary of Shakespeare was   1 Samuel Johnson 2 Christopher Marlowe   3 Geoffrey Chaucer   4 John Milton   5 William Wordsworth.

6. (   ) Lovelace belonged to the group of poets called   1 metaphysical   2 tragic   3 Cavalier   4 satirical 5 religious.

7. (   ) The publication of the *Lyrical Ballads* in 1798 ushered in 1 the Chaucerian age   2 the Renaissance   3 the age of Queen Elizabeth   4 the triumph of Romanticism 5 the Victorian Era.

8. (   ) Caesar gave up the attempt to defend himself against his assassins when he saw that   1 he was standing at the

foot of Pompey's statue   2 the hand of Brutus was
lifted against him   3 the senators were fleeing for their
lives   4 the omens were unfavorable   5 Casca had
stabbed first.

9. (   ) English drama may be said to have originated in   1 the
school   2 the church   3 the inn yard   4 the castle
5 the town square.

10. (   ) "God's in his heaven—
All's right with the world!"

was said by   1 Tennyson   2 Keats   3 Longfellow
4 Browning   5 Whittier.

Interpretation and reading ability with a poem or paragraph
given.

Read this poem and answer the items based on it:

"Far asunder, on separate coasts, the Acadians landed;
Scattered were they, like flakes of snow, when the wind from the
    northeast
Strikes aslant through the fogs that darken the Banks of Newfound-
    land.
Friendless, homeless, hopeless, they wandered from city to city,
From the cold lakes of the North to sultry Southern savannahs,
From the bleak shores of the sea to the lands where the Father of
    Waters
Seizes the hills in his hands, and drags them down to the ocean,"

1. (   ) The topic of this section of the poem is   1 the wind from the
northeast   2 the scattering and wandering of the Acadians
3 the cold lakes of the North   4 the landing of the
Acadians   5 the Father of Waters.

2. (   ) The Acadians were landed   1 on the Banks of Newfound-
land   2 on the bleak shores of the sea   3 on separate
coasts   4 in the cities   5 at Savannah.

3. (   ) "Friendless, homeless, hopeless," implies   1 sympathy
2 love   3 despair   4 wandering   5 pity.

4. (   ) "Seizes the hills in his hands, and drags them down to the
ocean" means that the Father of Waters   1 drowns the
hills in the ocean   2 has a pair of hands   3 acts like a
person   4 dissolves the rocks and carries the silt   5 acts
like a robber band.

5. (   ) The "Father of Waters" is the   1 Mississippi River   2
Red River   3 Canadian River   4 Cimarron River   5
Arkansas River.

3.2 English grammar. Also see illustrations used in this division under elementary subjects.

1. (   ) A sentence is a group of words that   1 tells something 2 asks something   3 contains a subject and a predicate 4 expresses a complete thought   5 contains a subject but no predicate.
2. (   ) Which of these groups of words is not a complete sentence? 1 Down the hill.   2 Down he fell.   3 Close the door. 4 Where is she?   5 Come in.
3. (   ) Auxiliaries are verbs which   1 are followed by a predicate word   2 are followed by a predicate adjective   3 help the main verb to make a statement or ask a question   4 explain something   5 make a comparison.
4. (   ) The complete subject is   1 a noun in the nominative case 2 the simple subject with its modifiers   3 the subject, verb, and object   4 the main word in the sentence   5 a proper noun.

3.3 English usage. Also see illustrations used in this division under elementary subjects.

1. (   ) "The foe is busy O King" said the messenger. How many commas are needed to punctuate this sentence correctly? 1 one   2 two   3 three   4 four   5 five.
2. (   ) Which of the following sentences is a complete sentence? 1 The house was made of logs.   2 The house made of logs.   3 The house of logs.   4 As the house was made of logs.   5 The house being made of logs.
3. (   ) The correct sentence is: 1 The girl breaked her bicycle. 2 The girl break her bicycle.   3 The girl broken her bicycle.   4 The girl broke her bicycle.   5 The girl breaking her bicycle.

3.4 Rhetoric.

1. (   ) A paragraph that is a complete theme in itself is called 1 a unit paragraph   2 a related paragraph   3 a transitional paragraph   4 an introductory paragraph   5 a concluding paragraph.
2. (   ) The sentence that expresses the main idea of the paragraph is called the   1 summary sentence   2 transition sentence   3 link sentence   4 periodic sentence   5 topic sentence.

3. (   ) The paragraph that develops a single topic and contains no detail that does not add to the understanding of that topic has   1 coherence   2 proportion   3 emphasis   4 unity   5 proper arrangement.

4. (   ) A sentence in which one cannot place a period before reaching the conclusion, without breaking up some grammatical unit, is called   1 a loose sentence   2 a balanced sentence   3 a periodic sentence   4 a simple sentence   5 a compound sentence.

5. (   ) Literature that has stood the test of time and universality is called   1 fiction   2 biography   3 autobiography   4 classic   5 drama.

6. (   ) The place where the consequences of all that has happened in a novel begin to appear is called   1 the plot   2 the climax   3 the theme   4 the philosophy of life   5 the setting.

7. (   ) The type of writing that portrays life as we ordinarily know it is called   1 romantic   2 realistic   3 naturalistic   4 adventurous   5 humdrum.

8. (   ) A prose narrative having a single plot and a few characters is called   1 a tale   2 a sketch   3 a novel   4 a short story   5 a novelette.

9. (   ) A discussion, either analytical or interpretative, is called   1 a treatise   2 an essay   3 a dissertation   4 a thesis   5 a tale.

10. (   ) The form of drama that deals with serious themes and that arouses the emotions of terror and of pity is called   1 tragi-comedy   2 tragedy   3 comedy   4 melodrama   5 farce.

11. (   ) The speech of an actor when he is alone on the stage is called   1 an aside   2 an epilogue   3 a soliloquy   4 a eulogy   5 a prologue.

4. Foreign languages. See the illustrations under all languages, as most of these forms can be used in any language.

    4.1 Latin.

    Latin vocabulary.

1. (   ) *Diēs* means   1 god   2 day   3 goddess   4 diet   5 long.

2. (   ) *Videō* means   1 I conquer   2 I see   3 It seems   4 I come   5 I hurl.

Translation of verb forms.

1. (   ) movēmus   1 we shall move   2 we are moved   3 let us move   4 we are moving.

Translation of sentences (comprehension).

1. (   ) Homo est magnus.   1 The man is large.   2 There is a large home.   3 Let us move.   4 We are moving.

Derivatives.

1. (   ) His words were *inaudible*.   1 impressive   2 useless   3 not able to be heard   4 loud   5 well chosen.

Construction.

1. (   ) Caesar se ad Germaniam iturum esse dixit.   *Se* is accusative because it is   1 object of *dixit*   2 object of *iturum esse*   3 object of *ad*   4 subject of *iturum esse.*

Paragraph reading from a paragraph given in Latin.

Tandem signum datum est. Tandem quattuor quadrigae per arenam volabant. Ego albatam incitabam, russatam Quintus incitabat. "Occupa locum interiorem. Laxa habenas!" Clamabam et diu auriga meus priorem locum tenebat. Iam victoriam sperabam, cum subito auriga in terram rota fracta iactabatur. In arena iacebat et trans corpus eius ceterae quadrigae volabant. Non iam auriga spirabat. O me miserum! Horrebam! Lacrimae oculos meos implebant. Tacebam.

1. (   ) Who held the inner place?   1 Quintus   2 the people   3 I   4 the one in white   5 the one in red.
2. (   ) What were the causes of the victory?   1 the four-horse chariots   2 the charioteer   3 the broken wheel   4 the tears   5 the given signal.
3. (   ) How many charioteers were hurled to the ground?   1 one   2 two   3 three   4 four   5 five.

4.2 French (See Latin forms).
Vocabulary.

1. (   ) ferme   1 frame   2 closed   3 farm   4 caught   5 make
2. (   ) garçon   1 because   2 waiter   3 girl   4 station   5 glove
3. (   ) soie   1 need   2 silk   3 thirst   4 when   5 soil
4. (   ) puis   1 next   2 though   3 punish   4 when   5 pull

Paragraph reading from a paragraph in French.

C'est aujourd'hui vendredi. Mardi dernier Jean, Robert, et moi, nous nous sommes levés avant le lever du soleil. Jean a regardé dehors pour voir quel temps il faisait. Le ciel était couvert de nuages et il commençait à pleuvoir. Il a plu pendant une heure, et alors le vent a chassé les nuages et bientôt il a fait très beau. A dix heures Robert et moi, nous sommes partis en automobile avec des choses à manger et Jean est venu plus tard à bicyclette. Au bout d'une heure nous nous sommes arrêtés près d'un petit lac où il y a de l'herbe et de beaux arbres. Jean et Robert ont joué à la balle pendant que je préparais le repas.

1. (   ) John, Robert, and I took a trip   1 last Monday   2 last week   3 last Wednesday   4 last month   5 last Tuesday.
2. (   ) When we arose,   1 it was snowing   2 the sun was shining   3 it was cloudy   4 it was sleeting   5 it was misting.
3. (   ) We stopped   1 on the side of a hill   2 at the foot of a mountain   3 by a small lake   4 under some trees   5 by a small stream.
4. (   ) John and Robert   1 made a fire   2 prepared the food   3 fished   4 played ball   5 went hunting.

Grammatical information.

1. (   ) In affirmative partitive constructions, **de**   1 is used with the definite article   2 is used alone   3 is used with the indefinite article   4 is used with the passive voice   5 is used with the plural of the definite article.
2. (   ) The preposition **de** plus a noun forms   1 an adverbial phrase   2 a substantive phrase   3 a prepositional phrase   4 a verb phrase   5 a noun phrase.
3. (   ) In a compound tense with **avoir,** the past participle agrees in gender and number   1 with the subject   2 with a direct object which follows   3 with the verb   4 with a direct object which precedes it   5 with an indirect object which precedes it.
4. (   ) A "result" clause in the future requires the "if" clause in the   1 present indicative   2 conditional   3 past definite   4 present subjunctive   5 imperfect.
5. (   ) The first person singular of the future of the verb **faire is je**   1 **ferais**   2 **fera**   3 **fit**   4 **ferai**   5 **fait.**

6. (   ) The second person plural of the passé composé tense of **venir** is **vous**   1 **êtes venu**   2 **venez**   3 **veniez**   4 **suis venu**   5 **aviez venu.**

4.3 German.
Vocabulary.

1. (   ) **liegen**   1 to tell a lie   2 to find   3 to fall   4 to lie   5 to rest.
2. (   ) **nötig**   1 quick   2 long   3 besides   4 noted   5 necessary.
3. (   ) **von**   1 in front of   2 upon   3 with   4 from   5 soon.
4. (   ) **Glas**   1 grass   2 pitcher   3 glass   4 glaze   5 sand.
5. (   ) **Brust**   1 joy   2 breast   3 brood   4 bride   5 leaf.

Reading a paragraph.

Der Philosoph Mendelssohn stand bei Friedrich dem Grossen in hohem Ansehen und war oft ein Gast an der königlichen Tafel. Einmal auf des Königs Einladung erschien er nicht. Endlich wurde der König ungeduldig; er nahm Bleistift und Papier und schrieb die Worte: "Mendelssohn ist ein Esel.—Friedrich II." Dieses Papier liess er unter den Teller des Philosophen legen. Bald darauf kam derselbe, las die Karte und steckte sie stillschweigend in die Tasche. Der König fragte schalkhaft: "Wollen Sie uns nicht den Inhalt des Briefes mitteilen?" "Recht gerne, Majestät," antwortete Mendelssohn, kaltblütig und las mit lauter Stimme: "Mendelssohn ist ein Esel, Friedrich—der zweite."

1. (   ) The King was   1 patient   2 bored   3 late to dinner   4 impatient   5 absent-minded.
2. (   ) The King took pencil and paper and wrote   1 a death sentence   2 a poem   3 a note to Mendelssohn   4 an order on the royal treasury   5 a treatise on philosophy.
3. (   ) He called Mendelssohn   1 his best friend   2 an ass   3 a great sculptor   4 a lazy rascal   5 an absent-minded professor.
4. (   ) Mendelssohn read the letter and   1 threw it in the King's face   2 tore it to pieces   3 lighted a cigar with it   4 put it back under the plate   5 put it into his pocket.

4.4 Spanish.
  Vocabulary.

1. (   ) **flor**   1 king   2 month   3 flower   4 water   5 dot.

2. (   ) **taza**   1 boy   2 pencil   3 rubber   4 dress   5 cup.

3. (   ) **padre**   1 mother   2 rose   3 father   4 garden   5 ribbon.

4. (   ) **agua**   1 coffee   2 egg   3 salt   4 water   5 bread.

5. (   ) **leche**   1 slate   2 milk   3 butter   4 brush   5 line.

6. (   ) **hacha**   1 tea   2 house   3 school   4 glass   5 ax.

7. (   ) **juego**   1 time   2 mistake   3 mark   4 error   5 yellow.

Completion of a sentence.

1. (   ) El gato es   1 un libro   2 un árbol   3 un animal   4 una hoja.

2. (   ) El río mas grande de la América del Sur es   1 Río Orinoco   2 Río Amazonas   3 Río Tapajas   4 Río Salado   5 Río Cauca.

3. (   ) La ciudad más grande de la América del Sur es   1 Montevideo   2 Santiago   3 Río de Janeiro   4 Buenos Aires   5 San Pablo.

4. (   ) La ciudad más importante de la América del Norte es   1 Chicago   2 Montreal   3 New Orleans   4 New York City   5 Seattle.

5. (   ) El hombre se monta   1 al caballo   2 a la gansa   3 a la oveja   4 a la vaca   5 al perro.

Statements about Spanish grammar.

1. (   ) Spanish words not having a written accent are accented on the next to the last syllable when they end in   1 *b* or *c*   2 *l* or *m*   3 *n* or *s*   4 *f* or *j*   5 *d* or *t*.

2. (   ) All Spanish nouns are   1 masculine   2 masculine or feminine   3 feminine or neuter   4 neuter   5 neuter or masculine.

3. (   ) The plural of nouns ending in a vowel is formed by adding   1 *os*   2 *us*   3 *es*   4 *s*   5 *is*.

4. (   ) Spanish adjectives agree with the nouns they modify   1 only in gender   2 both in gender and number   3 in person   4 only in number   5 in neither gender nor number.

5. (   ) In negative sentences, *no* is placed   1 before the verb   2 before the subject   3 before the direct object   4 after the verb   5 after the indirect object.

Reading a paragraph in Spanish.

En España los habitantes de las ciudades hacen tres comidas al día: el desayuno, el almuerzo, y la comida o la cena. Se desayunan a las ocho de la mañana y toman a esta hora café con leche, pan y mantequilla. Muchos toman chocolate en vez de café. Almuerzan a la una y comen a las siete o las siete y media. Algunas veces cenan después del teatro o la ópera.

1. (   ) ¿Cuántas comidas al día hacen los habitantes?   1 tres   2 cuatro   3 una   4 cinco   5 dos.

2. (   ) ¿A qué hora comen?   1 a las ocho de la manaña   2 a las siete   3 a las tres   4 a la una   5 a la una y cuarto.

3. (   ) ¿Que comida hacen a la una?   1 la comida   2 el desayuno   3 el almuerzo   4 café con leche, pan y mantequilla   5 la cena.

5. Home economics. Almost any type of informational material in cooking, sewing, home making, and so forth, may be used.

1. (   ) Backgrounds in the average living room should be   1 intense   2 subdued   3 conspicuous   4 obtrusive   5 dark.

2. (   ) Hue is the quality of color that   1 gives it its name   2 indicates its usefulness   3 shows its intensity   4 shows its fastness   5 indicates the amount of light and dark it contains.

3. (   ) The most important factor in selecting a rug is   1 wearing quality   2 color   3 length of pile   4 suitability   5 design.

4. (   ) The best flowering plant to use near a red brick house is   1 cerise crepe myrtle   2 purple lilac   3 pink rose   4 white spirea   5 golden glow.

5. (   ) Vegetables as a class are valued in the diet most highly for their content of   1 starch   2 fat   3 calories   4 minerals   5 protein.

6. (   ) The best beverage to serve in a child's meals is   1 cocoa
2 tea   3 coffee   4 Postum   5 milk.

7. (   ) The caloric value of an active junior high school girl's daily
diet should be about   1 one thousand   2 fifteen
hundred   3 two thousand   4 twenty-five hundred
5 three thousand.

8. (   ) A convenient height of a kitchen work table for a person of
average height (5′ 4″) is   (1) 24 inches from the floor
(2) 32 inches from the floor   (3) 36 inches from the floor
(4) 40 inches from the floor   (5) 44 inches from the
floor.

9. (   ) Cotton is a good material for summer underwear because it
is   1 thinner than wool   2 absorbent and dries slowly
3 a knitted material   4 elastic   5 a good conductor of
heat.

10. (   ) A requisite for developing desirable sleeping habits in the
infant is   1 extreme quietness   2 dark room   3
warm bath   4 regularity   5 sleeping bag.

11. (   ) A requisite for desirable eating habits for the infant is   1
quietness   2 regularity   3 cleanliness   4 adequate
food   5 attractive food.

12. (   ) A characteristic of a healthy child is   1 restlessness
2 activity   3 standard development   4 fastidiousness
concerning food   5 playfulness.

6. Mathematics.

6.1 Algebra.

Note. In writing the choices 1, 2, 3, 4, and 5 where the
answers are numerals, it is advisable to place the number of the
choice in parentheses.

1. (   ) If $a = 3$, $b = 5$, and $c = 6$, the value of $2a^2 - 3ab + 5c^2$ is
(1) 891   (2) 920   (3) 153   (4) 182   (5) 981.

2. (   ) If $x = 2$, $y = 3$, and $z = 5$, the value of $6xy + x^2z^2 - z^3$ is
(1) −66   (2) −13   (3) 11   (4) 66   (5) −21.

3. (   ) If $5x + 21 = 3x + 31$, $x =$ (1) 5   (2) 10   (3) 2
(4) 0   (5) −3.

4. (   ) If $3x + 16 + 2x - 6x = 4$, $x =$ (1) 11   (2) −12
(3) 2   (4) 12   (5) −24.

5. (   ) If $39 - 2x - 4 + 8x = 3x + 44$, $x =$ (1) 29   (2) 3
(3) 1   (4) $1\frac{1}{2}$ (5) 1.

6. ( ) If the perimeter of a rectangle is 48″ and its length is twice its width, the width is (1) 12″ (2) 32″ (3) 8″ (4) 16″ (5) 4″.

7. ( ) The exponent in the term $37y^4$ is (1) 2 (2) y (3) 7 (4) 37 (5) 4.

8. ( ) The third term in the expression $17x - 32y + 7z + 21$ is (1) x (2) $+$ (3) $7z$ (4) $-32y$ (5) z.

9. ( ) The complement of an angle of $37\frac{1}{2}°$ is (1) 75° (2) 56° (3) 89° (4) $52\frac{1}{2}°$ (5) $37\frac{1}{2}°$.

10. ( ) If $x - 9 = 0$, x equals (1) 1 (2) 9 (3) 3 (4) -9 (5) -1.

11. ( ) The supplement of an angle of 30° is (1) 40° (2) 70° (3) 110° (4) 150° (5) 170°.

6.2 Geometry.

1. ( ) The sum of the number of degrees in the interior angles of a triangle is equal to (1) 90° (2) 60° (3) 80° (4) 180° (5) 120°.

2. ( ) Lines in a plane which do not meet however far extended are 1 equal 2 similar 3 parallel 4 congruent.

3. ( ) If two angles of a triangle are equal, the triangle is 1 right triangle 2 isosceles 3 equilateral.

4. ( ) Two lines perpendicular to the same line are 1 alternate 2 parallel 3 bisectors 4 equal.

5. ( ) "If equals are added to equals, the sums are equal." This statement is called a (an) 1 axiom 2 theorem 3 corollary 4 postulate.

6. ( ) "All straight angles are equal." This statement is called a (an) 1 axiom 2 theorem 3 corollary 4 postulate.

Variation in form using figures.

1. ( ) The symbol for angle is the one marked by which figure?
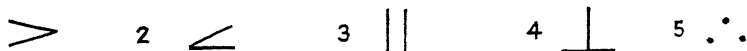
2. ( ) Which of these angles is obtuse?
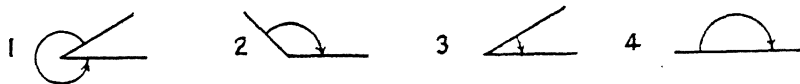
3. (   ) Which figure represents a line perpendicular to another line?
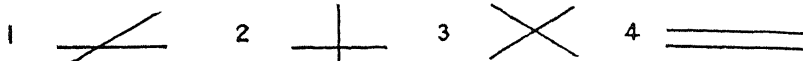
4. (   ) Which of these angles are not adjacent?
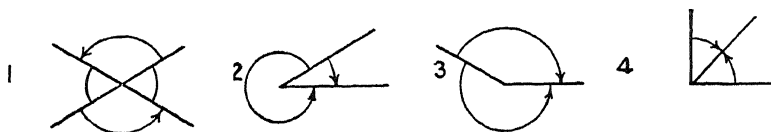
7. Manual training.

1. (   ) "No. 9" stamped on the shank of an auger bit indicates that the size of the bit is   (1) $\frac{5}{16}$ (2) $\frac{5}{32}$ (3) $\frac{9}{16}$ (4) $\frac{5}{8}$ (5) $\frac{9}{32}$.

2. (   ) The finest grade of sandpaper is   (1) No. 3   (2) No. 1   (3) No. 000   (4) No. 12   (5) No. 1.

3. (   ) The best material to use in making a dowel is   1 black walnut   2 magnolia   3 oak   4 birch   5 pine.

4. (   ) Interior paints are thinned with   1 water   2 oil   3 turpentine   4 alcohol   5 gasoline.

5. (   ) Varnish and paint brushes should be cleaned in   1 alcohol   2 water   3 gasoline   4 turpentine   5 linseed oil.

6. (   ) When doweling two long boards together, the edges should be trued up with a   1 jack plane   2 block plane   3 universal plane   4 jointer plane   5 smoothing plane.

7. (   ) The tool which can be adjusted to bore various-sized holes is called a(n)   1 auger bit   2 drill bit   3 expansion bit   4 adjustable bit   5 forstner bit.

8. Music.
Composers.

1. (   ) The composer who was elected to the Italian Parliament in 1860 was   1 Verdi   2 Paderewski   3 Donizetti   4 Paganini   5 Cherubini.

2. (   ) *Il barbiere di Siviglia* was written by   1 Bellini   2 Donizetti   3 Mozart   4 Schumann   5 Rossini.

3. (*) About the greatest of the song writers was   1 Berlioz   2 Donizetti   3 Rossini   4 Schubert   5 Liszt.

4. (   ) Beethoven wrote   1 *The Mount of Olives*   2 *Rosamunde*   3 *William Tell*   4 *Zampa*   5 *Genoveva*.

5. (   ) The great Polish pianist known as "the Poet of the Piano"
was   1 Chopin   2 Wolff   3 Tausig   4 Mikuli   5
Dobrzynski.

Theory.

1. (   ) B major has   1 one flat   2 three sharps   3 five flats
4 one sharp   5 six sharps.
2. (   ) F minor has   1 one flat   2 one sharp   3 four flats
4 two sharps   5 two flats.
3. (   ) D minor has   1 one sharp   2 two flats   3 four sharps
4 four flats   5 two sharps.
4. (   ) C minor has   1 three flats   2 five flats   3 one sharp
4 five sharps   5 one flat.
5. (   ) E major has   1 six flats   2 four sharps   3 two flats
4 four flats   5 five sharps.

9. Science.

9.1 Agriculture.

1. (   ) An annual plant is the   1 hollyhock   2 violet   3
morning glory   4 dahlia   5 rose.
2. (   ) The most useful garden tool is the   1 hoe   2 cultivator
3 pitchfork   4 harrow   5 shovel.
3. (   ) Plants absorb mineral in solution through their   1 roots
2 stems   3 leaves   4 bark   5 blossoms.
4. (   ) Orchard grass thrives best on   1 bottom land   2 hill-
sides   3 wooded areas   4 prairies   5 arid land.
5. (   ) Tobacco is planted   1 in rows   2 in hills   3 broad-
cast   4 in trenches   5 on ridges.

9.2 Biology.

1. (   ) The simplest of all protozoa is the   1 amoeba   2 para-
mecium   3 stylonichia   4 unisimplex   5 arachnida.
2. (   ) The calorie is a unit of   1 heat   2 light   3 weight
4 distance   5 sound.
3. (   ) Vitamins are classed under   1 carbohydrates   2 lipids
3 proteins   4 minerals   5 fats.
4. (   ) Zymase is   1 a stimulant   2 an enzyme   3 a fat
4 a nuberak   5 an element.

9.3 Chemistry.

1. (   ) Commercial lye is   1 sodium nitrate   2 sodium chlo-
ride   3 sodium hydroxide   4 ammonium chloride   5
sodium sulphate.

2. ( ) Marsh gas is   1 ethane   2 methyl orange   3 ammonia   4 methane   5 carbon dioxide.

3. ( ) Washing soda is   1 sodium carbonate   2 sodium sulphate   3 potassium chloride   4 potassium hydroxide   5 sodium chloride.

4. ( ) Epsom salts is   1 sodium nitrate   2 magnesium chloride   3 magnesium sulphate   4 sodium sulphate   5 sodium chloride.

5. ( ) Plaster of paris is   1 sodium silicate   2 calcium chloride   3 ammonium sulphate   4 calcium sulphide   5 calcium sulphate.

9.4 Physics.

1. ( ) The weight that an object loses in water is exactly equal to the weight of water that it   1 weighs   2 gains   3 displaces   4 raises on the sides   5 loses.

2. ( ) 1 cc. of air 0 degrees C. weighs   (1) four-thirds oz.   (2) .0001923 g.   (3) .1293 g.   (4) .001293 g.   (5) 1.032 g.

3. ( ) Atmospheric pressure at sea level is   (1) 14.6 lbs. per sq. in.   (2) 1,000 lbs. per sq. in.   (3) 76 lbs. per sq. in.   (4) four-thirds oz. per sq. in.   (5) 2 lbs. per sq. in.

4. ( ) Pressure one divided by pressure two is equal to volume two divided by   1 volume three   2 volume one   3 weight one   4 weight two   5 distance.

5. ( ) A metal much used for electric light filaments is   1 copper   2 manganese   3 iron   4 bronze   5 tungsten.

6. ( ) Voltaic cells are studied in   1 geology   2 bacteriology   3 photography   4 electricity   5 psychology.

7. ( ) The aneroid barometer depends upon the action of   1 mercury   2 metal membrane   3 electric current   4 buoyancy   5 light.

8. ( ) The ampere is a measure of   1 humidity   2 resistance   3 current   4 gravitation   5 potential energy.

9. ( ) Refraction is studied in connection with   1 sound   2 heat   3 falling bodies   4 buoyancy   5 light.

10. ( ) Isobars are used in diagramming   1 magnetism   2 rainfall   3 temperature   4 air pressure   5 humidity.

10. Social science.
10.1 Civics.

1. ( ) Supervision of highways is under the general supervision of the highway departments in cities, or the   1 county com-

missioners   2 governor   3 public welfare   4 Civil
Service Commission   5 Department of Commerce.

2. (   ) The duty of the State Militia is to   1 give orders   2
maintain highways   3 protect life and property   4
regulate government   5 regulate taxation.   ·

3. (   ) A territory of the United States is   1 Phillipine Islands
2 Alaska   3 Porto Rico   4 Tutuila   5 Guam.

4. (   ) The District of Columbia is governed by a commission of five
appointed by the   1 Senate   2 House of· Representa-
tives   3 Cabinet members   4 Secretary of State   5
President.

5. (   ) Matters pertaining to pensions, patents, reclamation, public
lands, natural resources, and the care and protection of the
Indians are under the supervision of   1 Department of
Commerce and Labor   2 Secretary of State   3 Congress
4 Department of the Interior   5 Speaker of the House.

6. (   ) All bills for raising revenue shall originate in   1 the Presi-
dent's office   2 Committees   3 the Senate   4 the
House of Representatives   5 either the Senate or the
House of Representatives.

7. (   ) Punishment, to be effective, must   1 be swift   2 be
severe   3 fit the crime   4 not be severe   5 always
include a prison sentence.

10.2 Government.

1. (   ) The earliest civilized government was established by   1
churches   2 kings   3 lawyers   4 people   5 priests.

2. (   ) The contribution that the Hebrews made to civilization and
government was   1 their early explorations   2 their
experience   3 their religion   4 their dogmatic spirit
5 the effect of their wars.

3. (   ) America's first contribution to democracy was the   1 Bos-
ton Tea Party   2 Declaration of Independence   3
French and Indian War   4 Mayflower Compact   5
settlement of Rhode Island.

4. (   ) The United States Senators are   1 appointed by the
governors   2 appointed by the state legislatures   3
chosen by convention   4 elected at large by the people
5 elected by the state senates.

5. (   ) Representatives and Senators in Congress are   1 district
officers   2 county officers   3 officers of the town where
they live   4 state officers   5 United States officers.

6. (   ) The last state to ratify the Constitution was   1 Massachusetts   2 Maryland   3 New York   4 Rhode Island   5 Virginia.

10.3 History.

1. (   ) The Dingley Tariff Bill was passed during the Presidency of   1 McKinley   2 Cleveland   3 Roosevelt   4 Taft . 5 Harrison.

2. (   ) The Rough Riders were led by   1 Wood   2 Wheeler   3 Roosevelt   4 Knox   5 Lee.

3. (   ) The Sixteenth Amendment to the Constitution related to   1 an income tax   2 woman suffrage   3 the election of Senators   4 prohibition   5 the Supreme Court.

4. (   ) The building of the Panama Canal was blocked for a time by   1 Panama   2 Venezuela   3 Peru   4 Colombia   5 Nicaragua.

5. (   ) The "Fourteen Points" were statements of   1 Woodrow Wilson   2 Foch   3 Lloyd George   4 Clemenceau   5 Orlando.

6. (   ) The League of Nations was rejected by   1 Italy   2 England   3 France   4 the American Senate   5 Japan.

7. (   ) The Reconstruction Finance Corporation Act was passed during the Presidency of   1 Hoover   2 Wilson   3 Coolidge   4 Harding   5 F. D. Roosevelt.

8. (   ) The person who flew around the world alone was   1 Charles A. Lindbergh   2 Harold Gatty   3 Wiley Post   4 Richard E. Byrd   5 Amelia Earhart.

9. (   ) The commander of the American Army in France was   1 Roosevelt   2 Wood   3 Hurley   4 Pershing   5 Baker.

10. (   ) Armistice Day is   1 October 16th   2 November 8th   3 April 6th   4 September 17th   5 November 11th.

11. (   ) Coolidge first attracted national attention during the   1 Boston Police Strike   2 World War   3 Presidential election of 1916   4 election of 1918   5 fight against the League of Nations.

Sentence Completion

Definition. The *sentence completion* will be defined as a sentence to be completed by a word, number, or phrase. The completion must be within the sentence, otherwise the form will be simple recall. Sentence completion is a recall test item in which the word, number, or phrase recalled is placed in a sentence to make the thought complete and true.

I. Rules for Constructing Sentence Completion Items

1. The greatest difficulty in making up this form is to make the sentences definite. Notice the several forms of indefiniteness pointed out below.

2. In some cases entirely different answers may fill the blank and make true and correct statements. The key, to be objective, should contain all possible answers. EXAMPLE:

1. A (1) dish in a school lunch helps to promote(_____) 1 ease of digestion.

It happens that the answer to this question was *hot*, but there are many other words which would make a correct statement: *fruit, laxative, warm, green, whole wheat,* and so forth.

3. In some cases the answer may be stated in different ways. EXAMPLE:

1. The Seventeenth Amendment to the Constitution provides for the election of Senators by
   (1).   (_____) 1

The answer to this question was stated on the key "popular vote," but it could also be stated "direct vote," "direct vote of the people," "vote of the people," and so forth. This item is also poor because the answer requires more than one word.

4. Some key words, though generally understood in a certain usage, have close synonyms which would also make correct statements if placed in the blank. EXAMPLE:

1. Fresh fruits which are shipped by rail may be
   preserved by a system of (1).   (_____) 1

"Refrigeration" would be the commonly used word, but
"cooling" or "icing" would make a true statement.
   5. Many items are indefinite to the reader because the
composer did not supply enough information to make the mean-
ing clear.   EXAMPLE:

1. Abraham Lincoln was born in (1).   (_____) 1

He was born in "1809"; he was born in "February"; he was
born in "a log house"; he was born in "Kentucky"; he was
born in "the United States."   Which is meant?
   A safe way of avoiding these evils of indefiniteness is to
include in sentence completion exercises sentences which have
a single, standard, definite answer.   Examples of good items are:

1. There are (1) tablespoons in one standard(*sixteen*   ) 1
   cup.
2. The upper house of Congress is called the (2).(*Senate*   ) 2
3. The Civil War ended in the year (3).   (*1865*   ) 3

   6. The opposite evil is that of using items so worded that
the answer is perfectly obvious, as:

1. A round-faced girl should part her hair on the (_____) 1
   (1), never in the (2).   (_____) 2

The "side" and "middle" are the only logical places on the
head where hair would be parted, and one would not say "in
the side" or "on the middle."
   7. Make such blanks as will call for one correct word or
phrase and not a large number of similar words or phrases.

POOR:

1. Evaporation is a process (1).   (_____) 1

The answer requires special wording and is too long to score
objectively.   Length of answers reduces reliability.   Of course,
longer answers can be rated with a fair degree of objectivity, but
there should be additional rules for scoring, such as counting
each correct idea one point.   The key must contain a list
of the ideas and the minimum necessary words to be counted

correct. The form is illustrated in the simple recall form history test, page 97.

8. The number of blanks in a single sentence affects the difficulty of an item; the larger the number of blanks, the more difficult the sentence is, other things being equal. However, two or three blanks are enough, especially at elementary and high school levels. So many words may be omitted that there are not sufficient words left on which to build any thought, and the test item becomes more of an intelligence test. The best plan is to vary the number of blanks from one to three. This will make difficulty vary.

9. Blanks may be anywhere within the sentence—at the beginning, at the end, or nearer the middle.

10. The best mechanical arrangement of the completion is to number the blanks within the sentence and then provide correspondingly numbered blanks to the right in which the words or phrases are to be written.[1] This places all written responses in a column; the key then can be made to mechanically match this column of answers and scoring is facilitated. The illustrations mentioned above under 5 (beginning "There are (1) teaspoons . . . ") and 6 are arranged in this manner. The scoring of blanks scattered through the page is both difficult and inaccurate.

11. The numbered blanks within the sentences should be of the same width; the blanks at the ends of the lines should be all of a sufficient width and space to allow space for writing.

12. In the sentence completion and all other recall forms, requiring the writing of words or phrases, the column of answers should always be placed to the right of the statements or sentences. In this position the statement is not covered by the hand while writing the answer. Over 70 per cent of pupils and teachers prefer the answers to the right of the statement in these objective forms. When this plan is followed, several recall forms may be used on the same page, thus placing all answers in one column. The position of the answers for recall items is, in general, opposite from the position of answers in the recognition form. These positions are so decidedly preferred by teachers and pupils that, as a rule, they should be observed.

---

[1] This form was probably first used by Rinsland, Henry D., and Smith, Arty B., in *Semester Tests*, based on Metcalf's *American Literature*, mimeographed edition, Bureau of Educational Research, University of Oklahoma, 1925.

No writing or part of the sentences should extend over into the column of answers.

13. Do not make up completion items by simply taking excerpts from a text and then deleting occasional words. Compose the sentence with some central or key word or phrase omitted.

14. Number the sentences consecutively and number the blanks consecutively. The two numbers would be the same only where there are the same number of blanks as number of sentences; in other words, one blank per sentence.

15. For tests in the lower grades, *all* blank spaces should be placed directly opposite the numbered blanks within the sentences.

16. Make the directions to the pupils clear and distinct. The following is a wording found clear to all pupils above the fourth grade. (In Grades 4–7 it may be necessary to explain the meaning of the word *correspondingly* used in the sample directions below.)

Directions. In each of the sentences below, one or more words, numbers, or dates are needed in the numbered blank spaces to make the sentences complete and true. Place the word or words in the correspondingly numbered blank to the right.

1. Nebuchadnezzar, King of (1), destroyed(_____) 1
   (2) and carried the people into exile.   (_____) 2
2. Darius made (3) the earliest great sea power(_____) 3
   in (4).   (_____) 4
3. The (5) of Egypt are the tombs where the(_____) 5
   kings of Egypt were buried.   .

Note. In subjects calling for numbers as answers, the word *numbers* should be included in the directions.

17. Rules for scoring. If each blank is a separate measurable item, count each blank correctly completed one point. If, however, the sentence is the unit measured, count each sentence complete and correct one point, regardless of the number of blanks within a sentence, provided all blanks are correct. Give no fractional values. Probably spelling and capitals should not be counted but measured separately. If counted in a completion test, give a separate score. It is usually wise to separate the measurement of information for spelling and grammar. Of course, all are important.

II. Samples of Sentence Completion in Elementary School Subjects

1. Arithmetic.

1. The (1) is the result of addition.   (_____) 1
2. The (2) is the number from which we sub-(_____) 2
   tract.
3. The number to be subtracted is called the (3).(_____) 3
4. The number multiplied is called the (4).   (_____) 4
5. The result of multiplication is called the (5).(_____) 5

A variation of the above form can be used in problem solving. The problem is so stated that the answer makes a complete sentence. For rapid and accurate scoring, all answers are placed in a column to the right.

1. If you lent Harry $50.00 for 1 year at
   5%, you would collect...............$(_____)
2. A radio set is listed at $360.00 with discounts of ` 15% and 12½%. The net
   price is............................$(_____)
3. If a cow averages daily 2 gallons of milk
   which is 4.1% butter fat, the butter fat
   she produces in a year is .... (_____) gal.
4. The interest on 200.00 at 7% for 2 years
   and 6 months is....................$(_____)
5. Jane took care of her neighbor's baby
   one afternoon from half-past one until a
   quarter to five. At 30 cents an hour, she
   earned.............................$(_____)
6. James solved correctly 17 out of 20 problems. The per cent he solved correctly
   was................................(_____)%
7. The interest on $50.00 at 6% for 120
   days equals........................$(_____)
8. A cylindrical silo 24 feet high and 10 feet
   in diameter will hold.................(_____) cu. ft.
9. In the metric system, the word *centi*
   means..............................(_____)
10. Mr. Hughes sold an automobile for $2400
    and received $480 commission. His rate
    of commission is....................(_____)%

2. Art.

1. The primary colors are (1), (2), and (3).(_____) 1
                                                   (_____) 2
                                                   (_____) 3
2. The secondary colors are (4), (5), and(_____) 4
   (6).   (_____) 5
                                               (_____) 6
3. The brightness or darkness of a color is called
   (7).   (,_____) 7
4. A pleasing arrangement of forms and colors is
   called (8).   (_____) 8
5. Purple is made by mixing (9) and (10).(_____) 9
                                               (_____)10

3. English.
   ### 3.1 Grammar.

1. A word which names something is a(n) (1). (_____) 1
2. A word which connects words or groups of
   words is a(n) (2).   (_____) 2
3. A word which states action, being, or state of
   being is a(n) (3).   (_____) 3
4. A word which modifies a noun or pronoun is
   a(n) (4).   (_____) 4
5. The name of a word that modifies a verb is
   a(n) (5).   (_____) 5

   ### 3.2 Usage.

1. In school this year I am studying (1), (2),(_____) 1
   and (3).   (_____) 2
                                               (_____) 3
2. Mary wished to go with the children to play.
   She opened the door and called to her mother,
   "Mother, (4) I go with my friends to play?"(_____) 4
3. If I (5) he, I should take magazines only. (_____) 5
4. Neither the pen nor the ink (6) here.   (_____) 6
5. He (7) me his tickets to the game because(_____) 7
   neither he nor his sister (8) going.   (_____) 8
6. Whom (9) you and your mother visit? My(_____) 9
   mother and (10) visited my grandmother.   (_____)10

4. Music.

1. In $\frac{4}{4}$ time a (1) note gets one beat.   (_____) 1
2. The first added line below the treble staff is
   (2).   (_____) 2
3. A half note equals one quarter note and two
   (3) notes.   (_____) 3
4. The sharps in the key of D are (4).   (_____) 4
5. A dot after a note increases the value of that
   note by (5).   (_____) 5
6. A whole rest is (6) the line.   (_____) 6
7. A (7) divides music off into measures.   (_____) 7
8. Another name for C time is (8).   (_____) 8
9. Two sixteenth notes (♪♪) are equivalent to one
   (9) note.   (_____) 9

5. Physiology.

1. The name of one of the small bones in the mid-
   dle ear is (1).   (_____) 1
2. The nerve of hearing is the (2) nerve.   (_____) 2
3. The sense of balance is called (3).   (_____) 3
4. The part of the ear which is connected with the
   sense of balance is the (4).   (_____) 4
5. Alcohol is one of the products of the process
   called (5).   (_____) 5
6. The colored part of the eye is called the (6).(_____) 6
7. If the eyeball is too short from front to back,
   causing nearby objects to be blurred while
   those far away are clear, the person is said to
   be (7).   (_____) 7
8. The largest part of the brain is the (8).   (_____) 8
9. The nerves which carry messages to the brain
   are called (9).   (_____) 9
10. The smallest division of the brain is the (10).(_____)10
11. The amount of water we should drink each day
    is at least (11) glasses.   (_____)11
12. The part of the brain which helps control the
    muscles of the body is the (12).   (_____)12

6. Reading.

Read this paragraph:

At last Dabrunka saw a light at the top of the hill.   She climbed
higher until she came to a rock, where a fire was burning.   Around the

fire were twelve stones; and on each stone sat a tall man wearing a long mantle and a hood upon his head. Three of these mantles were white like falling snow. Three were green like the grass of meadows. Three were golden like the sheaves of ripe wheat. And three were purple like the grapes of the vine. Dabrunka knew at once that these were the twelve months of the year.

1. At last Dabrunka saw a (1). (_____) 1
2. She climbed higher until she came to a (2),(_____) 2
   where a (3) was burning. (_____) 3
3. Around the fire were twelve (4). (_____) 4
4. On each stone sat a tall (5). (_____) 5
5. Dabrunka knew at once that these were the(_____) 6
   (6) months of the (7). (_____) 7

7. Social science.
7.1 Civics.

1. The general granting of manhood suffrage can
   roughly be said to date from the election of
   (1). (_____) 1
2. American traditions and ideals call for a(n)
   (2) of government. (_____) 2
3. To the (3) belongs jurisdiction over all the(_____) 3
   rights of citizens save only those occurring to
   the citizen under the (4). (_____) 4
4. (5) treaties assure the arrest of lawbreakers(_____) 5
   who have slipped into or out of our country to
   apparent freedom.
5. America has adopted plans for restricting(_____) 6
   immigration to get (6), not solely (7). (_____) 7
6. An alien must reside in this country (8)(_____) 8
   years before being eligible to his final papers
   making him a citizen of this country.
7. An applicant for citizenship in the United
   States must renounce (9) to any foreign(_____) 9
   power and must give up all claims to any title
   of (10). (_____)10
8. Laws as to immigration and naturalization are
   administered by the Bureau of (11) and of(_____)11
   (12) in the Federal Department of Labor. (_____)12
9. There are three outstanding difficulties which
   the average immigrant faces: the difficulty of
   getting good (13), the difficulty of getting(_____)13

proper (14), and the difficulty of finding a(_____)14
(15) worthy of child life.   (_____)15

10. A(n) (16) crime involves imprisonment in(_____)16
a penitentiary or the loss of civil or political
privileges.

11. A person has been in (17) when a petit jury(_____)17
has rendered a(n) (18) on the facts in his(_____)18
case.

12. The (19) Amendment deprives the states of(_____)19
power to pass laws denying to any person the
"equal protection of the law."

13. (20) government requires at least two well-(_____)20
organized parties.

14. Civil Service laws and rules usually require
that applicants for position under Civil Service
must prove their fitness by (21).   (_____)21

15. The (22) is the greatest agency now in use(_____)22
for the expression of public opinion.

16. Through investigation, education, and legis-
lation, we insure (23) progress.   (_____)23

17. To vote is one of the privileges of (24). (_____)24

18. The purpose of consumers' organizations is to
protect and better the interests of (25). (_____)25

19. The two-party system is characteristic of the(_____)26
(26) and of (27).   (_____)27

20. Our ideals and our traditions demand that
every person qualified for the suffrage must
vote directly for someone to represent him or
her in the (28).   (_____)28

21. Children born of (29) parents in the United(_____)29
States are citizens.

22. The American citizens are assured the protec-
tion of the United States Government in any
(30) country.   (_____)30

23. Man differs from the human animals in his
recognition of (31) as his Creator and his(_____)31
faith in a life after death.

24. The money spent by political parties comes
from (32) contributions.   (_____)32

25. Each political party in each state and in each
territory selects (33) representative(s) to sit(_____)33
on the national committee of that party.

7.2 *Geography.*

1. Trade within a country is spoken of as (1) (_____) 1
   trade; that of one country with another is
   called (2) trade.   (_____) 2
2. The chief coffee ports of Brazil are (3),(_____) 3
   (4), and (5).   (_____) 4
                                                  (_____) 5
3. The two countries leading in the production(_____) 6
   of beet sugar are (6) and (7).   (_____) 7
4. Sugar is produced in large quantities in (8),(_____) 8
   (9), and (10).   (_____) 9
                                                  (_____)10
5. The chief crops in the United States are(_____)11
   (11), (12), and (13).   (_____)12
                                                  (_____)13
6. The fishing grounds in North America are(_____)14
   found in the waters of (14) and (15).   (_____)15
7. The manufacturing industries in the United
   States leading in importance are (16) and(_____)16
   (17).   (_____)17
8. Great water power areas of the United States(_____)18
   are (18) and (19).   (_____)19
9. The state having the greatest population is
   (20).   (_____)20
10. The capital of the United States is (21).   (_____)21
11. The (22) river is the largest river in the(_____)22
    United States.
12. Turpentine is made from the (23) tree.   (_____)23
13. Coke is made by burning (24) in large ovens.(_____)24
14. The principal crop grown in the South and
    used in making cloth is (25).   (_____)25

7.3 *History.* ·

1. The Declaration of Independence was signed in
   the City of (1).   (_____) 1
2. The cotton gin was invented in the year (2)(_____) 2
   by (3).   (_____) 3
3. Coolidge belonged to the (4) party and took(_____) 4
   office in (5).   (_____) 5
4. Wilson took office in (6) and belonged to the(_____) 6
   (7) party.   (_____) 7

5. The telegraph was invented in the year of (8)(_____) 8
   by (9).   (_____) 9
6. Cabot's nationality was (10). He explored(_____)10
   for the (11) nation and discovered (12). (_____)11
                                                  (_____)12
7. Queen Anne's War was ended by the Treaty   (_____)13
   of (13) in the year (14).   (_____)14
8. The printing press was invented in the year(_____)15
   (15) by (16).   (_____)16
9. The title "Father of the Constitution" was
   applied to (17).   (_____)17

III. Samples in High School Subjects
1. Art.

1. A harmony which is composed of similar colors
   is called (1).   (_____) 1
2. A color scheme composed of colors which lie
   next to each other on the color wheel and con-
   tain one common color is a(n) (2) scheme. (_____) 2
3. Colors whose positions on the color wheel form
   an equilateral triangle are called a(n) (3)(_____) 3
   scheme.
4. A(n) (4) color scheme consists of the two(_____) 4
   colors lying opposite each other on the color
   wheel.
5. A(n) (5) harmony is one composed of colors(_____) 5
   not similar to each other.

2. Commercial.
2.1 Bookkeeping.

1. In making out a deposit slip, one should list
   each (1) separately.   (_____) 1
2. A personal check may be (2) to assure the(_____) 2
   payee that it will be paid.
3. When rent is paid for in cash, what account is
   debited? (3).   (_____) 3
4. Assets may be classified as tangible and (4). (_____) 4
5. The document for showing net profit or loss for
   a fiscal period is known as a(n) (5).   (_____) 5
6. The proprietor of a business may have two
   accounts: his capital account and a(n) (6)(_____) 6
   account.

7. A deduction for paying bills promptly is known
   as (7).   (_____) 7
8. If two copies are made of the same invoice, it is
   said to be made in (8).   (_____) 8

2.2 Commercial law.

1. Liabilities in the form of written promises to
   pay are called "Notes (1)."   (_____) 1
2. The party who signs a promissory note is known
   as the (2).   (_____) 2
3. The two parties to a bailment are known as the (_____) 3
   (3) and (4).   (_____) 4
4. The unauthorized signing of another's name
   with misrepresentation is known as (5).   (_____) 5
5. The contract between the insurance company
   and the insured is known as the (6).   (_____) 6
6. Property pledged with the lender as security
   for a loan is known as (7).   (_____) 7
7. The contract between a municipality and a
   public utility is known as a(n) (8).   (_____) 8
8. A person authorized to act for, or in the place
   of, another, by authority from him, is known as
   a(n) (9).   (_____) 9
9. A formal written document given by the seller
   to the buyer of personal property is known as
   a(n) (10).   (_____)10

3. English.
3.1 Literature.

1. Macbeth is a strong character whose ruin is
   brought about by his one weakness, (1).   (_____) 1
2. (2) and (3) are two characters who show(_____) 2
   moral development throughout the play.   (_____) 3
3. One character who deteriorates morally
   throughout the play is (4).   (_____) 4
4. The play begins on a note of (5) with the(_____) 5
   (6) on the heath, and ends on a note of(_____) 6
   (7) with (8) crowned as king.   (_____) 7
                                                      (_____) 8
5. Macbeth told himself he should not murder(_____) 9
   Duncan because Duncan was his (9), (10),(_____)10
   and (11).   (_____)11

6. Macbeth's only reason for killing Duncan was (12).   (_____)12

7. In the play, Macbeth murdered Lady Macduff and her children because (13) wanted the(_____)13 throne.

3.2 English grammar.

1. A(n) (1) is a word that modifies a noun or(_____) 1 pronoun.

2. In the sentence, "The house on the hill has stood for fifty years," *on the hill* is a(n) (2)(_____) 2 phrase and *for fifty years* is a(n) (3) phrase.(_____) 3

3. Conjunctions used in pairs are called (4).   (_____) 4

4. A(n) (5) is an adjective which completes the(_____) 5 predicate and modifies the subject.

5. Separating a sentence into its parts and show-ing the relationship of the parts to one another is called (6).   (_____) 6

6. A(n) (7) sentence states a fact.   (_____) 7

7. A(n) (8) sentence asks a question.   (_____) 8

8. (9) denotes sex.   (_____) 9

9. Nouns denoting males are (10); those denot-(_____)10 ing females, (11); those denoting things(_____)11 without animal life are (12).   (_____)12

10. The first person plural, active voice, indicative mood, past perfect tense of the verb *be* is *we* (13).   (_____)13

11. As a rule *should* is used as (14) and *would*(_____)14 as (15).   (_____)15

12. The word *group* is a (16) noun.   (_____)16

13. The (17) is used after the salutation of a(_____)17 friendly letter.

14. After the salutation of a business letter, punctuate with the (18).   (_____)18

15. The (19) is used to set off a short direct(_____)19 quotation.

16. If there is a conjunction between the inde-pendent clauses of a sentence, punctuate with(_____)20 a (20); if there is no conjunction, use a (.21).(_____)21

17. A subordinate clause may be used as a(n)(_____)22 (22), a(n) (23), or a(n) (24).   (_____)23
                       (_____)24

18. The (25) tense is used to express what is(_____)25
customary or always true.

Directions for this form must clearly state what the student
is given and what he is to do.　Of course, they may vary from
the sample directions given above under I, 16, page 56.

3.3 English usage.

1. Q: Can you catch the deer?
　 A: I am afraid I (1).　　　　　　　　　(_____) 1
2. Q: Is Frank here?
　 A: No, he (2).　　　　　　　　　　　　(_____) 2
3. Q: Are you very happy today?
　 A: No, (3) not.　　　　　　　　　　　(_____) 3
4. Q: Is that baby a boy?
　 A: No, (4) a girl.　　　　　　　　　　(_____) 4

Directions for this form must clearly state what the student
is given and what he is to do.　Of course, they may vary from the
sample directions given above under I, 16, page 56.

4. Foreign languages.
4.1 Latin.

1. A servant walks before you.
　 Apud (1) servus ambulat.　　　　　　(_____) 1
2. Who was answering you?
　 Quis tibi (2)?　　　　　　　　　　　(_____) 2
3. Troy has been attacked in vain.
　 Troja frustra (3).　　　　　　　　　　(_____) 3
4. The town will be captured.
　 Oppidum (4).　　　　　　　　　　　　(_____) 4

Directions for this form must clearly state what the student
is given and what he is to do.　Of course, they will vary from the
sample directions given above under I, 16, page 56.

4.2 French.

1. You will have to stay.
　 Il faudra que vous (1).　　　　　　　(_____) 1
2. This man is my brother.
　 (2) homme est mon frère.　　　　　　(_____) 2
3. Give me some of those pens.
　 Donnez-moi (3) ces plumes-là.　　　　(_____) 3

4. Who tells such a story?
   Qui raconte (4) histoire? (_____) 4

4.3 German.

1. She was drinking a cup of milk.
   Sie (1) eine Tasse Milch. (_____) 1
2. May we come in?
   (2) wir eintreten? (_____) 2
3. We need those long tables.
   Wir brauchen diese (3). (_____) 3
4. The room is ten feet wide.
   Das Zimmer ist zehn (4) breit. (_____) 4
5. I was to buy a pair of gloves.
   Ich (5) ein Paar Handschuhe kaufen. (*Use*(_____) 5
   imperfect.)

4.4 Spanish.

1. John and Mary were studying Spanish.
   Juan y María (1) el español. (_____) 1
2. That house yonder is mine. (_____) 2
   (2) casa es (3). (_____) 3
3. We should have gone if we had had the time. (_____) 4
   (4) si (5) bastante tiempo. (_____) 5
4. Giving it to him will not be easy.
   El dárselo a él no (6) fácil. (_____) 6
5. Tell him to come tomorrow. (_____) 7
   Díga (7) que (8) mañana. (_____) 8

5. Home economics.

1. On a warm day the best refreshment drink is
   (1). (_____) 1
2. The creaming of candy is due to formation of
   (2) crystals, and the graining of candy is due(_____) 2
   to the formation of (3) crystals. (_____) 3
3. A bed should air for at least (4) hours before(_____) 4
   being made up.
4. Vitamins, minerals, and water are (5) and(_____) 5
   (6) foods. (_____) 6
5. At least one (7) and one (8) should be(_____) 7
   furnished daily in the diet. (_____) 8
6. Brazil furnishes more than (9) the world's(_____) 9
   supply of (10). (_____)10

7. The two foreign cheese products most liked in (_____)11
   the United States are (11) and (12).   (_____)12
8. Egg yolk is an excellent source of (13) and a (_____)13
   good source of (14).   (_____)14

6. Mathematics.
6.1 Algebra.

1. The sign must always be written before a (1)(_____) 1
   number; if no sign appears before a number, the
   number is (2).   (_____) 2
2. The (3) of two or more numbers is the result (_____) 3
   obtained by multiplying the numbers together.
3. Every factor of a product is an exact (4) of (_____) 4
   the product.
4. The formula for the area of a rectangle is (5). (_____) 5
5. By the formula $I = PRT, P = \$3,600, R = 5\%$,
   $T = 4$ years, and $I = ($ 6 $)$.   (_____) 6
6. Both members of a(n) (7) may be divided (_____) 7
   by the (8) number without destroying the (_____) 8
   (9).   (_____) 9
7. By the formula $V = \frac{1}{3}hb, b = ($ 10 $), V = 117,$ (_____)10
   and $h = 13$.

A variation of the above form can be used.   The problem is
so stated that the answer makes a complete sentence.   For
rapid and accurate scoring, all answers are placed in a column
to the right.

1. If x is 5, then x^2 is (1).   (_____) 1
2. If a boy lost 25¢ out of x cents, he has left (2).(_____) 2
3. 7 less than 3 times the unknown number is
   (3).   (_____) 3
4. The sign of the sum of two negative numbers
   is (4).   (_____) 4
5. The sign of the product of two negative num-
   bers is (5).   (_____) 5
6. If an algebraic expression contains two or more
   terms, it is called a (6).   (_____) 6

6.2 Geometry.

1. The simplest element in geometry is the (1).(_____) 1
2. If a point moves, we say that it makes or
   generates a(n) (2).   (_____) 2

3. If a point moves always in the same direction, it makes a(n) (3). (_____) 3

4. If a point continually changes its direction, it makes a(n) (4). (_____) 4

5. If a line is made up of two or more straight line segments that have different directions, it is called a(n) (5). (_____) 5

6. If the sum of two angles is 90°, they are (6)(_____) 6 angles.

7. If two or more lines are cut by three parallel planes, their corresponding segments are (7).(_____) 7

8. Two lines perpendicular to the same plane are (8). (_____) 8

9. The section of the surface of a cone made by a plane parallel to the base is a(n) (9). (_____) 9

10. A plane perpendicular to a radius at its extremity is (10) to the sphere. (_____)10

7. Manual training.
7.1 Woodwork.

1. The chief reason for finishing wood is to (1)(_____) 1 grain of the wood and thus (2) of the piece.(_____) 2

2. To sandpaper a piece, one should always (3)(_____) 3 grain of the wood.

3. A (4) joint is made when two pieces of wood(_____) 4 cross each other at right angles and half of each piece is removed.

4. A saw used to cut parallel with the grain is (5). (_____) 5

5. When two pieces are joined together at 45° as in a picture frame, the joint is called (6). (_____) 6

6. The size of an auger bit in (7) of a(n) (8)(_____) 7 may be found on the shank. (_____) 8

7.2 Mechanical drawing.

1. Perspective drawing shows the object as it appears (1), but its line cannot be (2)(_____) 1 directly. (_____) 2

2. The basis of practically all working drawing is the (3) projection. (_____) 3

3. The only general rule of working drawings is to make as many views as a(n) (4) the object(_____) 4 and (5). (_____) 5

8. Music.

1. Tone results from the regularly recurring (1)(_____) 1
of a sounding body.
2. Tone (2) is that characteristic which enables(_____) 2
us to distinguish between the tone of a violin
and the same pitch produced by a piano.
3. The intervals characteristic of a major scale are(_____) 3
its (3) and (4).   (_____) 4
4. The (5) form of the minor scale employs a(_____) 5
minor sixth and a major seventh from the tonic.
5. The two modes used in our music are the (6)(_____) 6
and (7).   (_____) 7

9. Science.
9.1 Agriculture.

1. The Babcock Test determines the amount of(_____) 1
(1) (2) in milk.   (_____) 2
2. The only bee that lays eggs is the (3).   (_____) 3
3. The limiting plant food in Oklahoma soil is
(4).   (_____) 4
4. The part of the seed that contains the begin-
ning of plant growth is the (5).   (_____) 5

9.2 Biology.

1. Fish take oxygen into the blood stream through
(1).   (_____) 1
2. All parts of the alimentary canal of the frog are
held in place by a thin membrane called (2).(_____) 2
3. The frog is a (3) blooded animal.   (_____) 3
4. The top seven (4) of the backbone are called(_____) 4
(5).   (_____) 5
5. Early in the life of the tadpole its (6) appear(_____) 6
and its (7) becomes shorter.   (_____) 7
6. The monarch butterfly lays eggs from which
will come little (8).   (_____) 8
7. (9) are big, black birds that cry, "Caw, caw."(_____) 9
8. The duck's (10) are good paddles for swim-(_____)10
ming.

9.3 Chemistry.

1. Oxygen was discovered by an Englishman,
   (1), who found that upon heating (2),(_____) 1
   oxygen was formed.   (_____) 2
2. A binary compound always has (3) element(s)(_____) 3
   and the name of the compound ends in (4). (_____) 4
3. The uniting of (5) with iron to form iron rust(_____) 5
   is a(n) (6) change.   (_____) 6
4. (7) is the symbol for sodium.   (_____) 7
5. Sodium bicarbonate is the chemical name for
   (8).   (_____) 8
6. Washing soda is the common name for (9). (_____) 9

9.4 Physics.

1. Two kinds of energy are (1) and (2).   (_____) 1
                                              (_____) 2
2. The measure of the pressure of the electrical
   current is (3) and the measure of the amount(_____) 3
   of electrical current is (4).   (_____) 4
3. The resistance of a conductor varies directly(_____) 5
   as its (5) and inversely as its (6). (_____) 6
4. A current is (7) in a conductor when it cuts(_____) 7
   across a magnetic field.
5. Like magnetic poles (8) and unlike magnetic(_____) 8
   poles (9) each other.   (_____) 9
6. The internal resistance of a cell depends upon(_____)10
   its (10), (11), and (12).   (_____)11
                                              (_____)12

10. Social science.
10.1 Civics.

1. The number of members necessary to carry on
   business is (1).   (_____) 1
2. The present United States Senators from Okla-(_____) 2
   homa are (2) and (3).   (_____) 3
3. The salary of a United States Senator is (4).(_____) 4
4. The banding of all the different unions together
   forms (5).   (_____) 5
5. A person thinks he cannot get a fair trial in one
   court, so he calls for a (6).   (_____) 6

6. A bill for spending money must originate in
   (7).   (_____) 7
7. The first ten Amendments to the United States
   Constitution are called (8).   (_____) 8

10.2 Government.

1. The single tax was advanced by (1) in his(_____) 1
   book, (2).   (_____) 2
2. Socialism intends that all (3) property shall(_____) 3
   be owned and directed by the (4).   (_____) 4
3. The germ of socialism can be traced to (5),(_____) 5
   but the modern movement begins with (6).   (_____) 6
4. The Articles of Confederation were adopted in(_____) 7
   the second (7) in the year of (8) but were not(_____) 8
   placed in actual operation until (9).   (_____) 9
5. The highest court in the United States is the
   (10) Court.   (_____)10
6. The present speaker of the House of Repre-
   sentatives is Mr. (11).   (_____)11
7. The dismissal of an officeholder by the people
   is known as (12).   (_____)12
8. During the past fifty years there have been two(_____)13
   great parties, the (13) and the (14).   (_____)14

10.3 History.

1. The worship of ancestors is universal in (1).(_____) 1
2. The Great Pyramid was in the land of (2). (_____) 2
3. The caste system is an important part of the
   social system in (3).   (_____) 3
4. The cuneiform signs were used by the (4). (_____) 4
5. The hieroglyphic characters were used by the
   (5).   (_____) 5
6. The first coined money was the contribution
   of the (6).   (_____) 6
7. The Neolithic Age is also known as the (7).(_____) 7
8. Alexander the Great chose as the capital of his
   empire the city of (8).   (_____) 8
9. The dwelling place of the Homeric gods was
   believed to be (9).   (_____) 9
10. The principal governing body of Athenian
    democracy was the (10).   (_____)10

11. The most beautiful buildings in Athens were
    on the hill called the (11).   (_____)11
12. Aegean civilization began about 3,000 B. C. in
    (12).   (_____)12
13. The Greeks called themselves (13) to dis-(_____)13
    tinguish themselves from the "barbarians."
14. The city that was the intellectual center of
    Greece about 450 B. C. was (14).   (_____)14
15. The modern name for the Hellespont is (15).(_____)15
16. The writings that reflect life in the Greek world(_____)16
    about 1,000 B. C. are the (16) and (17). (_____)17
17. The chief cultural ties that united all Greeks(_____)18
    were (18), (19), and (20).   (_____)19
                                                       (_____)20
18. Many Greek statesmen who wished advice
    would visit Delphi to consult the (21).   (_____)21
19. The festivals that brought all Greeks together
    every fourth year were the (22).   (_____)22

Simple Recall

Definition. The *simple recall* test is one in which the answer is not suggested or given, but must be recalled. It differs from the sentence completion in that it does not require the completion of a sentence; that is, the recall is not within a sentence.

There are three main forms of simple recall. The first is a simple, short answer to a direct question; the second is a test item that instructs the student to name something or give specific information; and the third gives a stimulus word or phrase from which the pupil is to recall information.

I. Rules for Constructing Simple Recall Items

1. The test item should be so stated that the answer is very definite, clean-cut, and short. The objectivity of the answer is largely controlled by the statement of the test item and brevity in the answer.

2. Many of the questions of the old essay examination which have simple, definite answers either are simple recall or they can be broken up into several recall items. When this is done, it is possible to make the test objective by counting each separate response one point.

3. The reponse should call for a single word, phrase, or number.

4. The response should call for definite subject-matter information. If the response can be determined by general intelligence, the test will not measure subject-matter knowledge.

5. If the response may be answered several ways, as by synonyms, all possible correct answers must be given in the key, or the item should be reworded. Often, acceptable answers are so simple that the teacher can be informed that any other correct answer is acceptable. The latter situation may lower reliability.

6. When the test items are worded as questions and statements for the student to recall (as mentioned under the definition given above), it is usually better to put all of the questions

74

together in one group and all of the statements together in another group. See the exception to this in the physiology test, II, 5, on page 78.

7. The blanks provided for the responses should be in a column, and the wording of the test items should not run into this column. This facilitates speed and accuracy in scoring.

8. It is usually better for the student taking the test and the examiner scoring the test to have the responses for simple recall items at the right of the question or statement.

9. Many responses for answers may be in column formation when items and answers of a group are similar, as when the names of authors are supplied after a list of books. See the sample of a shorthand test, III, 2.2, on page 83.

10. Objectivity in scoring the answers will be increased when some simple rule regarding spelling is followed. In a test of subject-matter information, spelling is usually not considered. It is best to test spelling in a given field directly by a spelling test. However, if it is desired to mix spelling with information by the simple recall test, the student should be given two scores, one in subject-matter information and one in spelling.

11. **Rules for scoring.** Score each correct response one point.

12. **Rules for making the scoring key.** Simply make the scoring key fit mechanically the student's responses. Spelling is usually not counted unless it is obviously the wrong word. Test spelling by a separate spelling test.

13. **Spacing the response blank.** Space the blank for responses so that the pupil has room for writing. Children usually write larger than adults; therefore, allow at least two spaces between lines. Space test items according to answer blanks.

II. Samples in Elementary School Subjects

1. Arithmetic.
Question form.

1. John bought a tablet for five cents and a pencil for three cents. How many cents did both cost? (_____ _____) 1
2. What sign is used to mean "cents"? (_____) 2
3. In the number "37" which of the digits is the tens digit? (_____) 3
4. How many tens are there in 40? (_____) 4

5. How many cubic feet are there in a truck bed 14 feet long, 6½ feet wide, and 3 feet deep?   (_____) 5

6. At 18¢ per dozen, how many dozen oranges can be bought for $1.08?   (_____) 6

Statement form.

1. Reduce $\frac{29}{4}$ to a mixed number.   (_____) 1
2. Change $3\frac{8}{9}$ to an improper fraction.   (_____) 2
3. Mary went to the store and bought a 3-lb. fryer at 18¢ per lb.; 2 doz. cookies at 22¢ per doz.; 1 peck apples at $1.00 per bu.   Compute her bill. (_____) 3
4. Write as a fraction, reduced to lowest terms, .55.   (_____) 4
5. Find the sum of: 3.50, 2.785, 2.35, 5.005, and 3.205.   (_____) 5
6. Divide 6839 by $35\frac{1}{2}$.   Express your remainder as a fraction reduced to lowest terms.   (_____) 6

2. Art.
Question form.

1. Where is the Washington Monument located? (_____) 1
2. What do diagonal lines express?   (_____) 2
3. Strength is expressed by what kind of line?   (_____) 3
4. Repose is expressed by what kind of line?   (_____) 4
5. Where is the Huntington Art Gallery located? (_____) 5
6. What is the Taj Mahal?   (_____) 6

Stimulus form.

Directions.   Below is given a list of American artists.   Write the subject for which the particular painter is known in the blank to the right.

1. Couse   (_____) 1
2. Thayer   (_____) 2
3. Homer   (_____) 3
4. Trumbull   (_____) 4
5. Abbey   (_____) 5
6. Moran   (_____) 6

3. English.
3.1 Literature.
Statement form.

1. *The Adventures of Tom Sawyer* was written by (_____) 1
2. *The Spy* was written by   (_____) 2

3. *The Raven* was written by   (_____) 3
4. *The Last Leaf* was written by   (_____) 4
5. *The Ransom of Red Chief* was written by   (_____) 5

3.2 Grammar.
Question form.

1. What is the past tense of the verb *sit?*   (_____) 1
2. What part of the sentence receives the action of the verb?   (_____) 2
3. What mark of punctuation should follow a declarative sentence?   (_____) 3
4. In what case is the subject of a sentence?   (_____) 4
5. What part of speech connects words, phrases, and clauses?   (_____) 5
6. What mark of punctuation should follow an exclamatory sentence?   (_____) 6
7. The name of a town should be separated from the name of the state it is in by what mark of punctuation?   (_____) 7
8. What two parts of speech must every sentence contain or imply?   (_____) 8

Statement form.

Determine the part of speech of the underscored words in the following sentences. Write the names of the parts of speech in the blanks at the right.

1. That plan is a good one.   (_____) 1
2. I plan to go to Kansas City soon.   (_____) 2
3. The taste of soap is unpleasant.   (_____) 3
4. I tasted the candy before you did.   (_____) 4

3.3 English usage.

1. Name one subject you are studying in school. (_____) 1
2. Write the name of a grocery store.   (_____) 2
3. Write the name of a mountain.   (_____) 3
4. Write the name of a book.   (_____) 4

4. Music.
Recalling symbols when the names of symbols are given.

Names of Symbols	*Symbols*	
1. crescendo	(_____)	1
2. repeat marks	(_____)	2
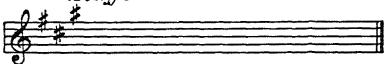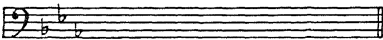
3. bass clef   (_____) 3
4. whole rest   (_____) 4

Recalling composition when composer is given.

1. Handel   (_____) 1
2. Wagner   (_____) 2
3. Beethoven   (_____) 3

Recalling signatures when staffs are given.

Staffs   Signatures

1.   (_____) 1

2.   (_____) 2

5. Physiology.

Statement and question form mixed.

Directions. Below is a number of statements and questions, each to be answered by one word or phrase. Write the answers in the parentheses to the right.

1. Name the outer layer of the skin.   (_____) 1
2. What is the name of the cells in the blood which
   fight disease germs?   (_____) 2
3. Give the name of the cells in the blood which
   carry oxygen to all parts of the body and carry
   off waste in the form of carbon dioxide. (_____) 3
4. Name the vessels that carry the blood away
   from the heart.   (_____) 4
5. What is the name of the motion created by the
   expansion and contraction of the walls of the
   blood vessels as the blood is pumped through
   them by the action of the heart?   (_____) 5
6. Name an important muscle-building food. (_____) 6
7. Give one reason why tight clothing should not
   be worn.   (_____) 7

Note. The above plan of using statements and questions may be used in any subject.

6. Reading.

Question form.

Read this paragraph:

Tommy Trout asked the Old Owl who lived in the shed by the mere about the Brownies.   She sent him to look in the lake, where he

saw only himself. She told him that all children are Brownies. The Small Children who are idle are called Boggarts, while those who are useful are called Brownies. Tommy and his brother, Johnny, were determined not to be hateful Boggarts. They swept the room, dusted, and picked up the litter in the kitchen every morning. Then they hurried back to their beds of heather in the malt loft before the Tailor and the Grandmother were awake. The Old Owl had said that Brownies did their good work in secret.

1. What is a characteristic of tiny people known
   as Boggarts?   (_____) 1
2. Where did the Old Owl live?   (_____) 2
3. Where did the boys go after their work was
   finished?   (_____) 3
4. Whose picture did Tommy see when he looked
   in the lake?   (_____) 4
5. Who was the other person living with the boys
   and the Tailor?   (_____) 5
6. What did Tommy and Johnny wish to become? (_____) 6

Statement form.

Read this paragraph:

After the Sioux Indians had completed their summer festivities, they divided into three groups. One went south, one went west, and the third group remained near the old place. Weeko, the wife of the war chief of the band going west, had twin boys. Nakpa, the mule, refused to carry anything but the twins as her part of the packs. Suddenly a blood-curdling sound was heard from the warriors who had gone ahead of the procession to watch for danger. Nakpa, taking a desperate chance, fled straight through the attacking party of Crow Indians. One of the enemies' arrows struck her saddle but did not harm the babies hung on each side of the saddle. Nakpa received a hero's decorations when she arrived in the old camp after surmounting many difficulties. The next day Weeko arrived in the camp with the few who had escaped alive. She was overjoyed to see her sons.

1. Name the weapons used by the Crow Indians. (_____) 1
2. Give a good title to the above paragraph.   (_____) 2
3. The Indians used various means in moving their
   possessions. Name one.   (_____) 3
4. Give the word of warning of an approaching
   attack.   (_____) 4
5. State the attitude of the Indians toward Nakpa
   when she arrived in the old camp.   (_____) 5
6. Name the season of the year this story took
   place.   (_____) 6

7. Social science.

7.1 Civics.

Statement form.

1. Give the number of people killed in the United
   States by automobiles last year.　　　(＿＿＿＿＿) 1
2. Name the legal process by which the governor
   of one state may have a criminal brought from
   another state.　　　　　　　　　　　(＿＿＿＿＿) 2
3. Give the number of the Amendment to the
   United States Constitution that gave women
   the right to vote.　　　　　　　　　(＿＿＿＿＿) 3
4. Name a law for the protection and promotion
   of health.　　　　　　　　　　　　(＿＿＿＿＿) 4
5. Name an important agency for controlling pub-
   lic utilities.　　　　　　　　　　　(＿＿＿＿＿) 5
6. Give the cost of public schools last year.　　(＿＿＿＿＿) 6

Question form.

1. What is the name usually applied to taxes col-
   lected on imported goods?　　　　　(＿＿＿＿＿) 1
2. From what source is money obtained chiefly to
   operate local government?　　　　　(＿＿＿＿＿) 2
3. What did the Organic Act establish?　　(＿＿＿＿＿) 3
4. What was the name of the first railroad in the
   United States?　　　　　　　　　　(＿＿＿＿＿) 4
5. Who built the first locomotive?　　　(＿＿＿＿＿) 5
6. How many immigrants live in the United States
   at present?　　　　　　　　　　　(＿＿＿＿＿) 6

7.2 Geography—Statement form and question form.

1. Give the location or area where most of the
   people of Australia live.　　　　　(＿＿＿＿＿) 1
2. Name the leading export of the country.　(＿＿＿＿＿) 2
3. Name the leading group of raw products of
   India.　　　　　　　　　　　　　(＿＿＿＿＿) 3
4. Where do the most progressive natives of Africa
   live?　　　　　　　　　　　　　　(＿＿＿＿＿) 4
5. Upon what does the development of African
   countries depend?　　　　　　　　(＿＿＿＿＿) 5
6. Where is the greatest wealth of the Belgian
   Congo found?　　　　　　　　　　(＿＿＿＿＿) 6

7. To what does Egypt owe its prosperity?   (_____) 7
8. In what way have the French contributed most
   to the development of Africa?   (_____) 8

   7.3 History.
   Question form.

1. Who was the first governor of the State of
   Oklahoma?   (_____) 1
2. What was the name of the land before it was
   known as Oklahoma?   (_____) 2
3. What famous German officer helped Washing-
   ton at Valley Forge?   (_____) 3
4. At what town did Washington capture the
   Hessians after crossing the Delaware in ice and
   snow?   (_____) 4
5. Who was the commander of the British at the
   beginning of the Revolution?   (_____) 5
6. What general was known as "The Swamp
   Fox?"   (_____) 6

   Statement form.

1. Name the first military encounter of the Revo-
   lutionary War.   (_____) 1
2. Give the chief cause of the American Revolu-
   tion.   (_____) 2
3. Name the country from which Louisiana was
   purchased.   (_____) 3
4. Name a song written by Francis Scott Key. (_____) 4
5. Tell what the correspondence between the
   American Government and France was called.(_____) 5
6. Name the President who declared the Embargo
   Act against England.   (_____) 6

III. Samples in High School Subjects
1. Art.
Statement form.

1. Write the date after which the best of American
   art was produced.   (_____) 1
2. Give the name of the best portrait painter of the
   Early American period.   (_____) 2
3. Write the date after which landscape painting
   appeared in the Early American period.   (_____) 3

4. Name the part of the country in which the early
   landscape painters worked.   (_____) 4
5. Write the name of America's best marine
   painter.   (_____) 5
6. Name the first American artist whose work can-
   not be classed in any school.   (_____) 6

   Question form.

1. What is the name given to the color scheme
   composed of one hue?   (_____) 1
2. What is the oldest element of design?   (_____) 2
3. What is the coldest color?   (_____) 3
4. What is the name given to the part of a design
   which ties together the dominant and the sub-
   dominant?   (_____) 4
5. What is the term used to designate the spotting
   of light and dark?   (_____) 5
6. What is the name of the color scheme composed
   of colors whose positions on the color wheel
   form an equilateral triangle?   (_____) 6

2. Commercial.
   2.1 Bookkeeping and law.
   Statement form.

Statement explaining a term	*Terms*
1. One who dies without making a will.	(_____) 1
2. The violation of an agreement or obligation.	(_____) 2
3. One who has been judicially declared unable to meet his liabilities.	(_____) 3
4. Citizen of one country residing in another.	(_____) 4
5. Judgment or decision of a court.	(_____) 5

   Question form.

1. What security is required for the appearance of
   a person in court?   (_____) 1
2. What are the final results of a trial, legally
   speaking?   (_____) 2
3. What is the name given "testimony of a
   witness"?   (_____) 3
4. What do we call an agreement to commit a
   crime?   (_____) 4

5. What is the name of an account recording the ownership of all assets invested in a business? (_____) 5

2.2 Shorthand.

Words	Word-Signs	Phrases	Abbreviated Words
back _____	will _____	to the _____	capable _____
nail _____	good _____	if you can _____	opportunity _____
flag _____	changes _____	I think _____	matter _____
ledger _____	named _____	on that day _____	popular _____
stars _____	workers _____	please wire _____	legal _____
plan _____	credit _____	next month _____	manager _____

3. English.
3.1 Literature.
Statement form.

1. State the pseudonym assumed by Samuel L. Clemens. (_____) 1
2. Name the play containing the character Hecate. (_____) 2
3. Name the English poet who wrote "The Daffodils." (_____) 3
4. Name the novel written by Sir Walter Scott which has the character Wambo. (_____) 4
5. Name the great English author of the sixteenth century. (_____) 5
6. State the name of the author of the following quotation: "The quality of mercy is not strained." (_____) 6

Question form.

1. Who wrote *Robinson Crusoe?* (_____) 1
2. What is one of Conan Doyle's most famous works? (_____) 2
3. Whose boyhood home is described in the poem "Snowbound"? (_____) 3
4. What American author places most of his novels in Alaska? (_____) 4
5. What period followed the Puritan period in English literature? (_____) 5
6. Who wrote *The Hind and the Panther?* (_____) 6
7. Who wrote *The Great Stone Face?* (_____) 7

3.2 Grammar.
  Statement form.

1. State the part of speech of the underscored
   word: "I told him to think the proposition
   over."   (——————) 1

2. Name the part of speech which denotes action
   or being.   (——————) 2

3. State the type of English of *carry* in the sen-
   tence: "Let me carry you home."   (——————) 3

4. Pick out the participial phrase in the sentence:
   "Crying for help, he staggered on though
   exhausted."   (——————) 4

5. Name the part of speech usually followed by
   an exclamation point.   (——————) 5

6. Write the word which designates subjunctive
   mood.   (——————) 6

7. Write the present passive infinitive of the verb
   burn.   (——————) 7

8. Write the plural form of the pronoun *she.*   (——————) 8

9. Write the past tense of the verb *burst.*   (——————) 9

10. Write the possessive form of the pronoun *he.*(——————)10

11. Write the comparative degree of the adverb
    well.   (——————)11

12. Write the second person plural of the personal
    pronouns.   (——————)12

  Question form.

1. What part of speech is usually omitted in an
   imperative sentence?   (——————) 1

2. What order is followed in the sentence:
   "Danced he in sheer delight"?   (——————) 2

3. What sort of an object tells to or for whom
   something is done?   (——————) 3

4. What kind of a pronoun is *this?*   (——————) 4

5. What is the first person, singular number,
   active voice, past tense, subjunctive mood of
   the verb *be?*   (——————) 5

6. What pronoun refers to persons and things?   (——————) 6

7. What is the mood of the verb in "Let us pray"?(——————) 7

8. What form of a verb is used as a noun?   (——————) 8

3.3 Usage.
  Statement form.

1. Name the quality beside emphasis and unity
   demanded in a paragraph.   (_____) 1
2. Name the spaces that must be left vacant at
   each side of the paper in composition writing.(_____) 2
3. Name the fourth step to be observed in letter-
   writing.   (_____) 3
4. State the one personal address that is not
   abbreviated.   (_____) 4
5. Define the form of the following sentence: "The
   man that I met is a hero."   (_____) 5
6. Name the error in the following sentence: "He
   told me to always be a good girl."   (_____) 6
7. Write the superlative of the word *little*.   (_____) 7
8. Indicate the punctuation to be used to indicate
   some sudden changes in sense or grammatical
   construction.   (_____) 8

  Question form.

1. What mark of punctuation should follow an
   interrogative sentence?   (_____) 1
2. In the sentence "Everybody loves a child who
   is unselfish," is *loves* singular or plural? (_____) 2
3. In what way may the possessive case be
   expressed beside the use of an apostrophe?   (_____) 3
4. What must a sentence express?   (_____) 4
5. What is the mechanical indication of a para-
   graph?   (_____) 5
6. How is a direct quotation set off from the rest
   of the sentence?   (_____) 6
7. In writing a business letter, what system beside
   the block system may be used in the form of the
   letter?   (_____) 7
8. What part of speech is *most?*   (_____) 8

4. Foreign languages.
  4.1 Latin—Stimulus form.

Directions. After each form, place a cross (X) in the proper space
to indicate the case and number of that form. Indicate both possi-
bilities for such forms as *servi*.

		Nominative	Genitive	Accusative
rosarum	Singular			
	Plural			
puellam	Singular			
	Plural			
servi	Singular			
	Plural			

Directions. After each Latin word in the following list, write the English equivalent. After each English word, write the Latin equivalent.

Latin to English Equivalent	*English to Latin Equivalent*
adsum _____	love _____
amplus _____	foreign _____
deus _____	provide _____
hic _____	and _____
imperium _____	have _____
ita _____	island _____

Directions. Opposite each form of Latin verb below is a place for recording by a simple cross (X) the number and person of the verb. Place a cross (X) under the proper number of the person and on the line of the singular or plural number. Under the column "Translation," write the English equivalent.

Verb	Number	1st Per.	2nd Per.	3rd Per.	Translation
habeo	Singular				
	Plural				
sedetis	Singular				
	Plural				
laudamus	Singular				
	Plural				
culpat	Singular				
	Plural				

4.2 French.
Question form.

1. Quel est le mot anglais pour **maison?**   (_____) 1
2. Quel est le mot anglais pour **chaise?**   (_____) 2
3. Comment dit-on en français **sister?**   (_____) 3
4. Quels sont les jours de la semaine?   (_____) 4
5. Combien de mois y a-t-il dans l'année?   (_____) 5
6. Quel animal est l'ami fidèle de l'homme?   (_____) 6

Statement form.

1. Mettez au pluriel **le cheval.**   (_____) 1
2. Nommez la capitale de la France.   (_____) 2
3. Mettez au pluriel **l'image.**   (_____) 3
4. Nommez la couleur de l'océan.   (_____) 4
5. Nommez le chant national de la France.   (_____) 5
6. Mettez au pluriel **la fille.**   (_____) 6

Note. See other illustrations under other foreign languages.
Practically all illustrations under each language are adaptable to
other languages.

4.3 Spanish.
Question form.

1. ¿Para qué sirve el lápiz?   (_____) 1
2. ¿Qué animal dice, "Bow-wow"?   (_____) 2
3. ¿Quiénes son sus padres?   (_____) 3
4. ¿Qué animal tiene la trompa?   (_____) 4
5. ¿Cuántos años tiene Ud.?   (_____) 5
6. ¿Qué hora es?   (_____) 6

Statement form.

1. Nómbreme Vd. el río más grande de los Estados
   Unidos.   (_____) 1
2. Dígame Vd. el nombre del presidente de los
   Estados Unidos.   (_____) 2
3. Dígame Vd. el color del cielo.   (_____) 3
4. Traduzca Vd. la palabra **papel** al inglés.   (_____) 4
5. Escriba Vd. la primera persona del singular del
   pretérito del verbo **ser.**   (_____) 5
6. Divida Vd. an sílabas la palabra **república.**   (_____) 6

Stimulus form.

Directions.   After each Spanish word, write its English equivalent.
After each English word, write its Spanish equivalent.

Spanish into English			*English into Spanish*		
la puerta	(_____)	1	Wednesday	(_____)	1
el abogado	(_____)	2	desk	(_____)	2
enero	(_____)	3	money	(_____)	3
la bañera	(_____)	4	spring	(_____)	4

Conjugation of verbs.

Instructions.   Following are a number of verb forms.   Under the
word *Conjugación,* indicate by the figure 1, 2, or 3 to what conjugation
each regular verb belongs.   Under the word *Irregular,* write the infini-
tive form of each irregular verb.   Under the words *Tiempo, Persona,*
and *Número,* write the information called for.

Verbo	Conjugación	Irregular	Tiempo	Persona	Número
Ud. vive					
ellos hablan					
él comía					
él tiene					
comprábamos					

Write after the following words the Spanish synonyms:

estar enfermo	(_____)	1	entender	(_____)	6
usar	(_____)	2	junto a	(_____)	7
allí	(_____)	3	desear	(_____)	8
luego	(_____)	4	contestar	(_____)	9
terminar	(_____)	5	torcido	(_____)	10

Write after the following expressions the Spanish equivalent:

1. He has put	(_____)	1
2. They gave	(_____)	2
3. We shall tell	(_____)	3
4. I had gone	(_____)	4
5. You will have seen	(_____)	5

5. Home economics.
Question form.

1. How much milk should a child drink daily? (_____) 1
2. What temperature is required for the refrigeration of meat? (_____) 2
3. What is a good substitute for meat? (_____) 3
4. What temperature for how many minutes does it take to pasteurize milk? (_____) 4
5. What do you use for thickening in making white sauce? (_____) 5
6. How often should the clothing and bed of a sick person be changed? (_____) 6
7. At what temperature is sponge cake baked? (_____) 7

Statement form.

1. Name a food element that potatoes contain more of than any other. (_____) 1
2. Name the ingredient added to tomatoes to neutralize the acid in making cream of tomato soup. (_____) 2
3. Name the ingredient used to make custards firm. (_____) 3
4. Name a natural food for babies. (_____) 4
5. Give the average rate of respiration for a normal adult. (_____) 5
6. Name the temperature at which cheese becomes tough. (_____) 6

Stimulus form.

Name of Cheese	*Where Originated*
1. Edam cheese	(_____) 1
2. Gruyère cheese	(_____) 2
3. Gorgonzola cheese	(_____) 3
4. Roquefort cheese	(_____) 4
5. Pineapple cheese	(_____) 5

6. Mathematics.
6.1 Algebra.
Question form.

1. If $m = 10$ and $n = 7$, what is the value of mn?(_____) 1
2. What is the numerical coefficient of $26ax^2$? (_____) 2

3. When the exponent of a literal number is not
   given, what is the exponent?   (_____) 3
4. What is the sign of the product of two numbers
   with negative signs?   (_____) 4
5. If a negative number is divided by a positive
   number, what is the quotient?   (_____) 5

Statement form.

1. Using r for radius, write the formula for the
   area of a circle.   (_____) 1
2. Give the algebraic name for such combinations
   as the following: $a - b$, mn, $wabc$, k/w.   (_____) 2
3. Divide: $\dfrac{ax^3 - a^2y - a^3}{a}$.   (_____) 3
4. Subtract the following: $24xy - 6y$
                          $\underline{12xy + 2y}$ (_____) 4
5. A certain number squared minus twice the
   number equals 15.   Find the number.   (_____) 5
6. The product of two numbers is 6.   The sum of
   the squares of the numbers is 37.   Find the
   numbers.   (_____) 6
7. Write the characteristic of the logarithms of
   .00001.   (_____) 7

6.2 Arithmetic—Statement form or computation in problem solving.

1. Add: 5 gal. 2 qt., 2 gal. 1 qt., and 6 gal. 3 qt.(_____)   1
                                                         gal.   qt.
2. Multiply: 8×1 bu. 3 pk.   (_____)   2
                                                         bu.
3. Give the number that is 20% more than 375.(_____)   3
4. Write $\frac{2\,3}{4}$% as a decimal.   (_____)   4
5. Find the rate of discount for a suit marked
   $30.00 which was sold for $25.00.   (_____)% 5
6. Find the interest on $1,500.00 for 9 mo. at
   6%.   \$(_____)   6

Note.   In the answers, the symbols for dollars and per-
centage and the names of measures (*gal.*, *qt.*, and *bu.*) are not
counted but are given.

6.3 Geometry—Question form.
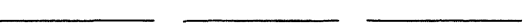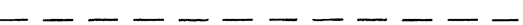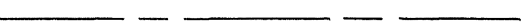
1. Are the diagonals of an inscribed trapezoid
   always equal?   (_____) 1

2. How many common tangents is it possible for
two circles to have?   (_____) 2
3. Do the braces on bridges and iron structures
requiring rigidity more often form three-sided or
four-sided figures?   (_____) 3
4. Are arcs of unequal circles ever congruent? (_____) 4
5. In a right triangle, where do the perpendicular
bisectors of the sides including the right angle
meet?   (_____) 5
6. What is the longest chord that can be drawn
through a point within a circle?   (_____) 6
7. How many sides has a regular polygon if each
angle has 140 degrees?   (_____) 7

7. Manual training.
7.1 Drawing.

Below are a number of lines.   Opposite each write the correct name.
1. ⟵—————————   —————————⟶   (_____) 1
2. —————— —————— ——————   (_____) 2
3. —————— — — ——————   (_____) 3
4. ————————————————   (_____) 4
5. — — — — — — — — — — — —   (_____) 5
6. ————————————————   (_____) 6
7. —————— — —————— — ——————   (_____) 7

7.2 Woodwork.

Opposite each operation write the name of the tool or tools used
in the operation.
1. Planing end grain.   (_____) 1
2. Driving nails.   (_____) 2
3. Straightening edges.   (_____) 3
4. Making mortises.   (_____) 4
5. Driving a chisel.   (_____) 5
6. Making circles.   (_____) 6
7. Making round holes in wood. (_____) 7

8. Music.
Question form.

1. What minor scale starts and ends on *la* of its
relative major and keeps the same tones as its
relative major?   (_____) 1
2. What is the interval between the fourth and
seventh tones of the major scale?   (_____) 2

3. How many sharps has the key of B?   (_____) 3
4. To what minor scale is A the relative major? (_____) 4
5. On what tone is the submediant of the G minor?(_____) 5

Statement form.

1. Write the symbol meaning *fortissimo.*   (_____) 1
2. Write an interval of P4 starting on F, fourth
   line bass staff.   (_____) 2
3. Write the harmonic minor scale of D, ascend-
   ing, in the treble staff.   (_____) 3
4. Name the flats, in order, in the key of E♭.   (_____) 4
5. Name all the sharp keys in order.   (_____) 5

Stimulus form—Recalling period when composer is given.

Composer	*Period*	
1. Debussy	(_____)	1
2. Handel	(_____)	2
3. Liszt	(_____)	3
4. Schumann	(_____)	4
5. Mozart	(_____)	5

9. Science.
9.1 Agriculture.
Question form.

1. How deep have alfalfa roots been known to
   grow?   (_____) 1
2. When should alfalfa be planted?   (_____) 2
3. What is the most popular variety of soy beans?(_____) 3
4. To what class of poultry does the Leghorn
   belong?   (_____) 4
5. Where did the Shorthorn cattle originate?   (_____) 5

Stimulus form.

Directions. After each breed write the name of the animal for which it is used.

1. Holland   (_____) 1
2. Poland China   (_____) 2
3. Guernsey   (_____) 3
4. Dorset   (_____) 4
5. Persian   (_____) 5
6. Rhode Island Reds (_____) 6

9.2 Biology.
Question form.

1. How does a plant cell get its food?   (_____) 1
2. How does an amoeba get its food?   (_____) 2
3. What is the first product of photosynthesis? (_____) 3
4. How many pairs of legs does a quadruped have?(_____) 4
5. How many compound eyes does a spider have?(_____) 5
6. How many pairs of wings does a grasshopper
   have?   (_____) 6

Stimulus form.

Directions. After each item write the name of the man best connected with the subject or event.

1. Laws of heredity.   (_____) 1
2. Study of fermentation.   (_____) 2
3. Discovery of tuberculosis germ.   (_____) 3
4. Vaccination against smallpox.   (_____) 4
5. A Dutch lens grinder.   (_____) 5
6. A study of the fruit fly chromosomes and genes;
   the theory of the gene.   (_____) 6
7. The fight against yellow fever.   (_____) 7

9.3 Chemistry.
Question form.

1. What Englishman first discovered oxygen?   (_____) 1
2. What is the symbol for copper?   (_____) 2
3. If you increase the pressure on a given volume
   of a gas, the temperature remaining constant,
   how will its volume vary?   (_____) 3
4. How many liters are contained in any gram
   molecular weight of a gas under standard
   conditions?   (_____) 4
5. What element do all organic compounds
   contain?   (_____) 5
6. Of what alcohol are the esters true fats?   (_____) 6

Statement form.

1. Write the atomic weight for magnesium.   (_____) 1
2. Write the formula for a molecule of hydrogen.(_____) 2
3. Write the formula for the acid anhydride of
   nitric acid.   (_____) 3

4. Write the formula for the base formed upon the
   reaction of CaO with water.   (_____) 4
5. Write the gram molecular weight for calcium
   carbonate.   (_____) 5
6. Write the general formula for the methane or
   paraffin series of compounds.   (_____) 6

   Stimulus form.

   Symbol   *Name*
1. NaCl   (_____) 1
2. MgSO$_4$ (_____) 2.
3. AlCl$_3$ (_____) 3
4. FeSO$_4$ (_____) 4
5. Bi$_2$S$_3$ (_____) 5

   9.4 Physics.
   Question form.

1. For what is the barometer used?   (_____) 1
2. On what does the downward force on the
   bottom of any vessel containing a liquid
   depend?   (_____) 2
3. What is the force which binds like substances
   together?   (_____) 3
4. What is the work done by a force of one gram
   acting through a distance of one centimeter? (_____) 4
5. What is the rate of doing work called?   (_____) 5

   Stimulus form.

Directions. Write opposite each ratio the name of the ratio.

1. $\dfrac{\text{Velocity}}{\text{Time}}$ (_____) 1
2. $\dfrac{\text{Volts}}{\text{Amperes}}$ (_____) 2
3. $\dfrac{\text{Mass}}{\text{Volume}}$ (_____) 3
4. $\dfrac{\text{Stress}}{\text{Strain}}$ (_____) 4

10. Social science.
   10.1 Civics.
   Stimulus form.

Directions. Write opposite each legislative power the department
of government which has this power.

1. Coin money.   (_____) 1
2. Vote school tax.   (_____) 2
3. Regulate intrastate commerce.   (_____) 3
4. Give advice to President.   (_____) 4
5. Make laws concerning everybody.   (_____) 5

Question form.

Directions. Write opposite the power the name of the court involved.

1. In what court is a case that involves less than
   $100 tried?   (_____) 1
2. In what court is an argument between two
   states settled?   (_____) 2
3. In what court does a case involving from $100
   to $1000 start?   (_____) 3
4. A case that is first tried in a United States
   District Court is tried in what court next?   (_____) 4

10.2 Government.
Question form.

1. In what state can the I.W.W. be traced to a
   miners' strike in 1903?   (_____) 1
2. To whose basic teaching does the I.W.W.
   movement go back?   (_____) 2
3. What is the simplest type of community called?(_____) 3
4. What is any group of people working together
   for a common purpose of providing food,
   shelter, and clothing called?   (_____) 4
5. Who preceded the early American farmers?   (_____) 5

Statement form.

1. Give the estimated number for 1935 of chil-
   dren in this country needing special medical
   attention.   (_____) 1
2. Name the kind of school attendance laws pre-
   vailing in all the states.   (_____) 2
3. Give the name of an army officers' training
   school kept up at public expense and located
   on the Hudson River.   (_____) 3
4. Name the present Secretary of the Treasury.   (_____) 4
5. Name the two Senators from Oklahoma.   (_____) 5

10.3 History.
Question form.

1. Who was President of the North during the
   Civil War? (_____) 1
2. Who invented the steamboat? (_____) 2
3. What famous fort stood where Philadelphia
   now stands? (_____) 3
4. What did Samuel Morse invent? (_____) 4
5. Who was President of the United States during
   the World War? (_____) 5

Statement form.

1. Name the town near which the first oil well in
   Oklahoma was located. (_____) 1
2. Name the town that was the original capital of
   Oklahoma. (_____) 2
3. Give the name of the river that borders Okla-
   homa on the south. (_____) 3
4. Give the name of the first American to make
   explorations in Oklahoma. (_____) 4
5. State the name of the first Frenchman to visit
   Oklahoma. (_____) 5

Stimulus form.

Directions. Write opposite each colony the date of the first
settlement.

1. Georgia (_____) 1
2. Maryland (_____) 2
3. Massachusetts (_____) 3
4. New York (_____) 4
5. Virginia (_____) 5

Recall involving a complete sentence or statement.

Directions. Write answers to these questions on the lines given.

1. What was the benefit of the War of 1812 to the(_____
   United States? _____) 1
2. How did the Monroe Doctrine benefit the(_____
   countries of the Western Hemisphere? _____) 2
3. What political principle did the Civil War(_____
   settle once and for all? _____) 3

Scoring.

The key contains a complete statement for each answer. If the underscored words are in the student's response, the response is correct. If additional statements are added but these do not contradict the underscored portion, the statement is correct.

<div align="center">KEY</div>

1. Commercial independence of the United States was secured.
2. It prevented European interference or aggression.
3. The principle of states' rights was settled.

Note. It is often advisable to give certain common but incorrect answers as samples of what is not correct.

This form is applicable to many other subjects in both high school and elementary school.

CHAPTER V

Matching

Definition. There are two varieties of *matching*. These are called *sentence completion matching* and *column matching*. The first will be illustrated throughout with rules and the second will be illustrated less completely. The rules for construction are practically the same. *Sentence completion matching* will be defined as a form requiring completing a sentence by matching it with a column of items from which one item or phrase is chosen to complete the sentence. In this form the word, number, or phrase to complete the sentence is actually given in a column and the student simply chooses the correct one. In *column matching*, words, sentences, numbers, or phrases in two columns are matched; that is, the student simply shows which items go together.

I. Rules for Constructing Sentence Completion Matching

Much material does not lend itself to matching. Only questions that can be answered by one or two words and questions that have absolutely definite and indisputable answers are adaptable to this form.

1. The best arrangement of matching items is to place together questions requiring the same type of answer, thus not mixing in the right-hand column entirely different types of answers, which reduce the number of plausible choices and ultimately resolve the exercise into a multiple choice with only two or three choices for certain items. Notice the following illustration (an exercise in grammar).

General illustration of POOR MATCHING *group:*

1. ( ) Did you and your father go? Yes, he and ( ) went.	1. adjective
	2. adverb
2. ( ) Who is the taller, you or your sister? I am taller than ( ).	3. *Aesop's Fables*
	4. can
3. ( ) What did you see? I ( ) a horned toad.	5. clause
	6. good

4. (   ) Did he run fast? Yes, he (   ) very   7. her
     fast.   8. I
5. (   ) Did you and your sister give Harry a   9. infinitive
     present? Yes, (   ) and I gave him   10. may
     a present.   11. me
6. (   ) James said to the teacher, "Please,   12. participle
     (   ) I have this paper?"   13. phrase
7. (   ) Is this your pencil? It (   ) is mine.   14. ran
8. (   ) The shepherd found the sheep <u>which</u>   15. run
     <u>had strayed.</u> The underscored group   16. saw
     of words is called a (   ).   17. seen
9. (   ) We returned late. The word *late* is   18. she
     an (   ).   19. sure
10. (   ) They started <u>in the morning</u>. The   20. surely
     underscored part is called a (   ).   21. *Treasure Island*
11. (   ) The word *bark* can be used as a noun   22. verb
     and also as a (   ).
12. (   ) A verb used as an adjective is called a
     (   ).
13. (   ) We learned <u>to swim</u>. The under-
     scored part is called an (   ) phrase.
14. (   ) Robert Louis Stevenson wrote (   ).

The right-hand column contains a mixture of actual word forms (*I, she, her*), grammatical forms (*phrase, adjective, infinitive*), and two names of books. Obviously, question 14 should be taken out and put into a multiple choice form or a matching group consisting entirely of authors and their works. The rest of the questions should be divided into two groups: one testing the word forms (questions 1, 2, 3, 4, 5, 6, 7), and the other testing grammatical forms (questions 8, 9, 10, 11, 12, 13).

Similar grouping can be done for other subjects. This will divide the matching exercises into several parts. The question numbers will be continuous through the parts. Of course, the numbers of the choices in the right-hand column will begin with "1" in each group. Since matching groups cannot extend from one page to another, the length of matching parts will be limited under each subject.

The items within each group should sample the same general type of responses; that is, the right-hand column of responses should be of the same general classification, men's names, events, books, nomenclature in science, words to be

defined, and so on.   The left-hand column may sample different
phases of material, provided the right-hand column consists of
responses of one type.   The ideal situation is one where every
word in the right-hand column will grammatically fit, except in
English, into every item in the left-hand column, but where
only one response is true and correct for one item.   In this
situation the student has to know the subject matter in order
to get the answer correct.   Guessing is almost eliminated.   A
good example of items given in the right-hand column which are
of the same general type of response will be found under Arith-
metic, page 104.   The chief objection to most matching items
is the violation of this principle of similarity in the types of
responses which are given in the response column.

The number of responses should always exceed four or five,
because four or five responses are used in the multiple choice
form, and the principal advantage of the matching test is that
it offers more choices than the multiple choice test.   Matching
is really a multiple choice form.

2. Do not test unimportant words in a statement, as:

POOR: The larger the marketing association is,   1. less
     the (   ) influence it will have on the market   2. more
     price.
POOR: Curing cowpea hay is (   ).   1. difficult
                                                         2. easy

3. Avoid using the main verb as the tested word; that is,
using it to fill the blank.

POOR: Culling the flock (   ) a good poultry   1. is
     practice.   2. is not

4. Never put the blank at the beginning of the item (this
would require capitalizing the response word in the column,
which would give it away), unless blanks begin all the sentences,
as:

(   ) introduced the Spoils System.   1. Andrew Jackson

5. Avoid such clues as having some words in the right-hand
column plural and some singular, unless the list is long and these
forms are about evenly divided.   Another clue is the use of *a*
or *an* before the blank.   If the article is required, write it thus:
John is a(n) (   ) noun.   Following is an example of a group that
is poor owing to clues.

1. (   ) The hunter shot a deer. *Deer* in this   1. derivatives
         sentence is an (   ) noun.   2. object
2. (   ) The trees were oaks. *Oaks* in this sen-   3. predicate
         tence is a (   ) noun.   4. prefix
3. (   ) Such words as *powerless, actor,* and *aim-*
         less are (   ).
4. (   ) The first syllable of such words as
         review, unseen, and *rediscover* is called
         (   ).

In the first two items the *a* and *an* are definite clues, both to the fact that the answer will be in the singular and to whether it will begin with a vowel or a consonant. In the third item, the plural verb *are* would obviously require the only plural word in the column.

6. Avoid having a small number of dates, names, or other distinctive facts in a general list, since these obviously reduce the range of choice. An illustration of this is the two names of books in the long column in the general illustration given in I.1.

7. Put more items in the right-hand column than in the left if possible. This gives an opportunity for putting in a few fake choices, but these fakes should be real and sensible. Notice the general illustration in I.1.

8. Be sure that the right-hand column is alphabetized correctly, to at least the third letter of words. In a column of numbers, arrange items in numerical order.

9. Alphabetization of names within a column. Try to use names as they are most commonly known. That is, some men are commonly known by only their last names (for example, Caesar, Roosevelt, Shakespeare), while others are always spoken of by both names (as Edgar Allan Poe and Robert E. Lee). Within one column, use all names one way or the other. If all are written with first names, alphabetize by the first names. Do not use first names and alphabetize by last names. The following column is in poor order:

1. Captain Oliver Perry
2. France
3. Gen. William Hull
4. James Barron
5. Jefferson
6. John Marshall
7. Lawrence
8. New Orleans

10. Do not capitalize words in the right-hand column unless they should normally be capitalized. See the right-hand column in the general example I.1, where the rules of capitalization are correctly followed.

11. Check and recheck to see that for each sentence only one word in the right-hand column could possibly fit in the blank and make a true statement. However, the same word may be used to correctly answer more than one item in the left-hand column. The only sure and safe way of checking is to read each item and attempt to put in the blank each word in the response column. Often, words of different forms may fit in the blank and make a true statement, but since you have only one type of answer in mind, you are likely to overlook some that might make a true statement under some circumstances. Note the following example:

Poisons produced by germs growing in the body are (   ).

Along with other words in a long response column were the words:

> antitoxins
> dangerous
> numerous
> toxins

Of course, the answer is *toxins*, but the poisons are also *dangerous* and they may be *numerous*. Therefore, the question has three correct answers. One way of perfecting this particular situation is by such a rewriting as:

Poisons produced by germs growing in the body are called
   (   ).   toxins

12. It is not necessary that the number of sentences and the number of items to the right be the same. In fact, it is almost always better to have a few more items in the right-hand column than necessary. These should be false, but it should require subject-matter knowledge on the part of the student to know this. Imperfect matching also increases difficulty. An item in the right-hand column may be used for two sentences or items in the left-hand column, but no sentence or item in the left-hand column should *ever have* two items to complete it or match it.

13. Unless there are more than five items in the right-hand column from which to choose, the form is really the same as

multiple choice, as far as measurements are concerned, although the mechanical placement of the choices is different. Therefore, all forms of matching should have more than five items from which to choose. The number should never exceed the number necessary to complete the page; that is, students should never be required to turn a page to look for an item.

14. Additional rules for column matching.

14.1 In general, what applies to the grouping of sentence completion matching items applies to column matching, except that the left-hand column cannot offer as much variety in the column matching as in the sentence completion matching. Rules 5, 6, 7, 8, 9, 10, 11, 12, and 13 of the sentence completion matching also apply to column matching.

14.2 Do not try to match items that have only a vague connection, and be sure that the connection between the items of the two columns is clear. Note the following:

1. ( ) Al Smith	1. California
2. ( ) Calvin Coolidge	2. New Jersey
3. ( ) Herbert Hoover	3. New York
4. ( ) Woodrow Wilson	4. Ohio
	5. Vermont

The student would not know whether the right-hand column were supposed to contain the states in which these men were born, the states from which they were elected, or the states of which they were governors. Tell what is to be matched.

14.3 Always have the phrases or sentences to the left, as these cannot be placed in alphabetical order.

14.4 A sample of one item correctly answered is often necessary to make the directions clear. If a sample is used, mark it as a sample; have it a regular item in the column to the left and have the answer come from one of the items in the right column. See the illustration in the test under Music, 4, page 107.

15. Directions for matching.

15.1 Sentence completion matching.

Directions. In each of the sentences below, one word or phrase is needed to complete the sentence and make it true. Find the correct word or phrase in the column to the right and place its number in the parentheses in front of the sentence.

15.2 Column matching.

Directions. Below are given two columns. For each item or phrase in column one, there is one that matches it in column two. Find this item, word, or phrase and place its number in the parentheses in front of the item or phrase in the first column.

16. Rules for scoring. Count each correct response one point. Count no fractional points.

II. Samples in Elementary School Subjects

1. Arithmetic.
Sentence completion matching.

1. (   ) The number to be multiplied is the (   ).   1. difference
2. (   ) The result of addition is called the (   ).   2. dividend
3. (   ) The number to be divided is the (   ).   3. divisor
4. (   ) The result of subtraction is called (   ).   4. minuend
5. (   ) The result of multiplication is called (   ).   5. multiplicand
                                                          6. multiplier
                                                          7. product
                                                          8. sum

Column matching.

1. (   ) 7 times 6.   1. 11
2. (   ) 80 divided by 5.   2. 15
3. (   ) 170 minus 159.   3. 16
4. (   ) 50 plus 31.   4. 42
                             5. 64
                             6. 81

The application of matching to arithmetic is limited. Definitions and words they define may be placed in matching form.

2. Art.
Column matching.

Type of Architecture	*Country*

1. (   ) Doric order   1. Chaldaea
2. (   ) Mastabas   2. Crete
3. (   ) Pagodas   3. Egypt
4. (   ) Topes   4. Greece
5. (   ) Basilica   5. India
6. (   ) Ziggurat   6. Italy
                          7. Japan
                          8. Mesopotamia

Sentence completion matching.

1. (   ) (   ) painted one hundred one pictures   1. George Inness
   of George Washington.   2. Gilbert Stuart
2. (   ) *The Harp of the Winds* was painted by   3. Henry Sargent
   (   ).   4. James Whistler
3. (   ) *The Landing of the Pilgrims* was painted   5. John Copley
   by (   ).   6. John Sargent
4. (   ) The artist remembered for a portrait of   7. Winslow Homer
   his mother in black and gray is (   ).
5. (   ) *The Three Graces* was painted by (   ).

3. English.
3.1 Grammar.
Sentence completion matching.

1. (   ) A word which asserts action, being, or   1. adjective
   state of being is called a(n) (   ).   2. article
2. (   ) The (   ) is used to separate words or   3. capital letter
   groups of words in a series.   4. colon
3. (   ) The mark of punctuation which follows an   5. comma
   abbreviation is the (   ).   6. dash
4. (   ) The (   ) is the mark of punctuation which   7. period
   follows the salutation in a business letter.   8. subject
5. (   ) That part of the sentence which tells who   9. verb
   did something is the (   ).

Column matching.

Directions.   Below are given two columns.   For each underscored
word or phrase in the sentences in the first column, there is an item
that matches it in the second column.   Find the name of this item
in the second column and place its number in the parentheses in front
of the sentence in the first column.

1. (   ) He lived in an old house.   1. adjective
2. (   ) Our class enjoyed the picnic.   2. adverb
3. (   ) Boys and girls play tennis.   3. conjunction
4. (   ) Never before had I driven so slowly.   4. interjection
5. (   ) You wrong me by your suspicions.   5. noun
6. (   ) My aunt suffers much from headache.   6. preposition
7. (   ) Hurrah! the game is won.   7. pronoun
8. (   ) Would you like to go with us?   8. verb
9. (   ) We must go, for it is late.
10. (   ) His work was entirely successful.
11. (   ) His work was entirely successful.

3.2 Names of parts of the form of a letter.

Directions. Below is given a letter with parts numbered from
1 to 6. In the right-hand column are the names of the parts of a
letter. Identify each part of this letter by placing in the parentheses
to the left the number of its name given in the right-hand column.

1. (   )   124 North Broad Street   1. body
                   Oklahoma City, Oklahoma   2. complimentary close
                   December 31, 19__   3. heading
                                                    4. indented form
2. (   ) Brown Brothers   5. inside address
                   Thirteenth and Market   6. postscript
                   San Francisco, California   7. salutation
                                                    8. signature
3. (   ) Gentlemen: 9. superscription

4. (   )   The set of dining room furniture
          which I bought at your store was
          delivered in bad condition. The
          buffet is scratched, the edge of the
          table chipped, and one of the chairs
          is imperfect.

                   I am disappointed at receiving
          these damaged articles, but feel
          sure that you will rectify matters
          satisfactorily.

5. (   )   Very truly yours,
                             Jane A. Lane

6. (   )   (Mrs. F. A. Lane)

4. Music.

4.1 Knowledge of musical terms and symbols.[1]

Directions. The column at the left below is divided into parts.
Part I contains fifteen musical terms of expression. Part II contains
fifteen musical symbols. The column at the right gives nineteen
meanings for each part, fifteen of which are the meanings for the terms
and symbols in the column at the left. You may not know some of the
musical terms and symbols, but find the meanings to as many of
them as you can.

You are to answer each part separately. Place the *number* (not
the word or words) of the meaning on the line within the parentheses
at the left of the term or symbol with which the meaning is connected.
The sample (*S*) at the beginning of each part is marked correctly.

---

[1] Scott, Delbert W., *Achievement in Music of Intermediate Grade Pupils*, master's
thesis, University of Oklahoma, 1934.

Begin here :

PART I
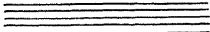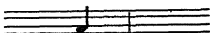
Musical Terms and Symbols	*Meanings*
S. (*8*) giocoso	1. disconnected
1. ( ) andante	2. gradually louder
2. ( ) cantabile	3. in a singing style
3. ( ) con grazia	4. in time
4. ( ) dolce	5. light
5. ( ) animato	6. lively
6. ( ) con spirito	7. moderately slow
7. ( ) legato	8. playful
8. ( ) leggiero	9. simple
9. ( ) con espressione	10. slower
10. ( ) ben marcato	11. smoothly connected
11. ( ) allegro	12. softer
12. ( ) cres.	13. sustained
13. ( ) a tempo	14. sweet
14. ( ) rit.	15. well marked
15. ( ) staccato	16. with animation
	17. with expression
	18. with grace
	19. with spirit

PART II

S. (*11*)	♩	1. accent
16. ( )	⨯	2. bass clef
17. ( )	♯	3. flat
18. ( )	𝄢	4. gradually louder
19. ( )	>	5. gradually softer
20. ( )	♭	6. hold
21. ( )	⌢	7. loud
22. ( )	*mf*	8. measure
23. ( )	♮	9. moderately loud
24. ( )	*p*	10. natural
25. ( )	𝄢	11. note
26. ( )	*f*	12. repeat-bar
		13. rest
27. ( )		14. sharp
		15. slur
28. ( )		16. soft
		17. staff
29. ( )		18. tie
30. ( )		19. treble clef

5. Physiology.
Sentence completion matching.

1. (   ) The blood forms a great (   ) system for our bodies.
2. (   ) The body is supplied with air by breathing or (   ).
3. (   ) Dr. Jenner introduced the use of (   ) for the prevention of smallpox.
4. (   ) We breathe air into the lungs by a process called (   ).
5. (   ) Indoor air is kept fresh and better suited to our use by means of (   ).

1. circulation
2. expiration
3. inspiration
4. pasteurization
5. prevention
6. respiration
7. superstition
8. transportation
9. vaccination
10. ventilation

6. Reading.
Sentence completion matching.

1. (   ) Hiawatha's father was named (   ).
2. (   ) Hiawatha lived near a beautiful lake called (   ).
3. (   ) Nokomis was visited by (   ).
4. (   ) The Indians called Hiawatha (   ).
5. (   ) "Minnehaha" means (   ).
6. (   ) "Hiawatha" means (   ).
7. (   ) Hiawatha married (   ).

1. Eugene Field
2. Gitchee Gumee
3. Gitche Manito
4. Great Spirit
5. Henry W. Longfellow
6. Iagoo
7. Ishkoodah
8. Laughing Water
9. Minnehaha
10. Mudjekeewis
11. Nokomis
12. Strong Heart

Column matching.

1. (   ) "The Brownies."
2. (   ) "The Story of Li'l Hannibal."
3. (   ) "The Wishing Gate."
4. (   ) "The Brown Thrush."
5. (   ) "Wynken, Blynken, and Nod."
6. (   ) "The Wild Swans."

1. Carolyn S. Bailey
2. Eugene Field
3. Frances Fox
4. Hans Christian Andersen
5. Jane L. Hoxie
6. Louise E. Chollet
7. Lucy Larcom
8. May Robbins

7. Social science.
7.1 Civics.
Column matching.

1. (   ) An estimate of expenses.
2. (   ) A gift of money from a public treasury.
3. (   ) Careful use of resources.

1. asset
2. budget
3. conservation

4. (   ) Deliberately doing poor work or destroy-   *4. exploitation
         ing property.   5. gold
                                                          6. liability
                                                          7. sabotage
                                                          8. subsidy

7.2 Geography.
Sentence completion matching.

1. (   ) The chief industry in Finland is (   ).   1. dairying
2. (   ) The leading occupation of the people of   2. farming
         Switzerland is (   ).   3. fishing
3. (   ) The leading occupation of the Russians is   4. hunting
         (   ).   5. lumbering
4. (   ) Glasgow, Scotland, is noted for its (   )   6. ship building
         industry.

Column matching.

1. (   ) The largest city in England.   1. Constantinople
2. (   ) The capital of France.   2. Geneva
3. (   ) The capital of Switzerland.   3. London
4. (   ) The most important city in Persia.   4. Paris
5. (   ) An important seaport in Turkey.   5. Tehran
                                                         6. Vienna
                                                         7. Warsaw

7.3 History.
Sentence completion matching.

1. (   ) The man who crossed the Isthmus   1. Balboa
         of Panama and discovered the   2. Cartier
         Pacific was (   ).   3. Columbia
2. (   ) The new leader chosen to lead   4. Cortez
         DeSoto's men into Mexico was   5. Ericsson
         (   ).   6. Montezuma
3. (   ) The man who explored Florida   7. Moscoso
         searching for a "fountain of   8. Pizarro
         youth" was (   ).   9. Ponce de Leon
4. (   ) The chief of the Aztec Indians of   10. Quivira
         Mexico was (   ).
5. (   ) Labrador was probably discov-
         ered by (   ).
6. (   ) America might have been better
         called (   ).

---

* While unavoidable in a text, it is not desirable to break the columns in matching tests.

Column matching, matching men and events. The use of this form is almost unlimited in history.

Events		*Men*
1. ( ) Capture of Fort Ticonderoga.		1. Benedict Arnold
2. ( ) "Common Sense."		2. Burgoyne
3. ( ) Declaration of Independence.		3. Cornwallis
4. ( ) Surrender at Saratoga.		4. Ethan Allen
5. ( ) Capture of Vincennes.		5. George Rogers Clark
6. ( ) Surrender of Yorktown.		6. Thomas Jefferson
7. ( ) Revolutionary traitor.		7. Thomas Paine

III. Samples in High School Subjects

1. Art.

Column matching.

Famous Pieces of Sculpture	*Artists*
1. ( ) "Pieta."	1. Auguste Rodin
2. ( ) "Moses."	2. Daniel French
3. ( ) "Mourning Victory."	3. Giovanni Bologna
4. ( ) "Rape of the Sabines."	4. Jean Corpeaux
5. ( ) "The Thinker."	5. Michelangelo
6. ( ) "Discobolus."	6. Myron
	7. Paul Dubois

Sentence completion matching.

1. ( ) The combination of colors which lie next to each other on the color wheel and contain one common color is a(n) ( ) scheme.
2. ( ) There are two types of color harmonies: related and ( ).
3. ( ) A one-hue color scheme is known as ( ).
4. ( ) A scheme composed of two adjacent colors on the color wheel and their complements is known as ( ).
5. ( ) Harmonies in which the colors are similar are called ( ) harmonies.
6. ( ) Two colors which when combined produce gray are said to be ( ) of each other.

1. analogous
2. complements
3. contrasting
4. double complement
5. monochromatic
6. related
7. split
8. triad

2. Commercial.

2.1 Bookkeeping and commercial law.
Sentence completion matching.

1. (   ) The party who draws up an
       instrument is known as the (   ).
2. (   ) A traveler's check is payable only
       to the (   ).
3. (   ) To be valid, a draft must be
       accepted by the (   ).
4. (   ) An owner who accepts a negoti-
       able instrument in good faith is
       a(an) (   ).

1. bearer
2. drawee
3. holder in due course
4. indorsee
5. maker
6. payee

2.2 Bookkeeping.
Column Matching.

1. (   ) A money order drawn on an
       express company.
2. (   ) A money order drawn on a post-
       master.
3. (   ) A check drawn on a bank by
       its cashier.
4. (   ) The form provided by the bank
       on which to list the money and
       cash items to be deposited.
5. (   ) A special bank form signed by
       each depositor used to verify
       signatures on checks.
6. (   ) A strip which contains a record
       of the information on the check.
7. (   ) A written acknowledgment of
       cash.
8. (   ) An itemized statement of goods
       bought or sold.
9. (   ) A check drawn on one bank on
       funds deposited in another bank.
10. (   ) A summary of an individual
       customer's account showing bal-
       ance due.

1. bank draft
2. bank statement
3. bill
4. cashier's check
5. check
6. check stub
7. deposit ticket
8. express money order
9. invoice
10. note
11. note stub
12. postal money order
13. receipt
14. receipt stub
15. sales ticket
16. signature card
17. statement of account
18. traveler's check

2.3 Typing and shorthand.
Sentence completion matching.

1. ( ) The ( ) is depressed for paragraph indentation.
2. ( ) After writing a whole line and the carriage refuses to move any farther, the ( ) may be pressed and the word can be finished.
3. ( ) The cylinder may be rolled forward any fractional part of a space after the ( ) has been operated.
4. ( ) In order to move the carriage backward one space, the ( ) is depressed.

1. back-space key
2. line-space lever
3. margin stop release
4. paper clamps
5. shift key
6. tabular keys
7. variable line space

3. English.

3.1 Literature.
Sentence completion matching—Illustration of quotations.

1. ( ) _____said, "Nothing but death shall stay me."
2. ( ) _____said, "Thou shalt see me at Philippi."
3. ( ) _____said, "I was not born to die on Brutus' sword."
4. ( ) _____said, "O coward that I am, to live so long!"
5. ( ) _____said, "If you have tears to shed, prepare to shed them now."
6. ( ) _____cried out, "Liberty! Freedom! Tyranny is dead!"
7. ( ) _____said, "What means this shouting?"
8. ( ) _____said, "Et tu, Brute?"
9. ( ) _____said, "Beware the Ides of March!"
10. ( ) _____offered Caesar the Crown.

1. Antony
2. Brutus
3. Caesar
4. Cassius
5. Cinna
6. Ghost
7. Octavius
8. Poet
9. Soothsayer

Literary information from a book.

Directions. In each sentence below, one word is needed to complete the sentence. Find the correct word in the column at the right

and place its number in the parenthesis in front of the sentence. The test is based on *The Idylls of the King*.

1. (   ) The girl imprisoned in the tower by the knights Sir Morning Star, Sir Evening Star, and Sir Noon Day Star was (   ).

2. (   ) It was (   ) who floated, dead, in a barge to Arthur's castle.

3. (   ) Sir (   ) was in love with Guinevere.

4. (   ) Sir Torre and Sir Lavaine were the brothers of (   ).

5. (   ) The Holy Grail was seen first by (   ).

6. (   ) Modred and Gawaine were the brothers of (   ).

7. (   ) The vampire who tried to wreck Arthur's Court was (   ).

8. (   ) Of the the three sons of Lot and Bellicent, (   ) was the least honorable and had the blankest shield.

9. (   ) Excalibur was the sword belonging to (   ).

10. (   ) The body of (   ) was carried to Avalon after he was mortally wounded.

11. (   ) Sir (   ) was the master of meats and drinks at Arthur's Court.

1. Arthur
2. Bellicent
3. Elaine
4. Galahad
5. Gareth
6. Gawaine
7. Guinevere
8. Kay
9. Lancelot
10. Lavaine
11. Lot
12. Lynette
13. Lyonors
14. Modred
15. Percival
16. Torre
17. Vivian

Column matching—Illustration of matching authors and periods.

1. (   ) Alfred the Great
2. (   ) Francis Bacon
3. (   ) Sir Thomas Browne
4. (   ) John Bunyan
5. (   ) Caedmon
6. (   ) Geoffrey Chaucer
7. (   ) Cynewulf
8. (   ) John Dryden
9. (   ) Robert Herrick
10. (   ) Ben Jonson

1. Age of Chaucer
2. Anglo-Norman Age
3. Anglo-Saxon Age
4. Elizabethan Age
5. Puritan Age
6. Renaissance
7. Restoration

11. (   ) William Langland
12. (   ) Layamon
13. (   ) Sir Thomas Malory
14. (   ) Christopher Marlowe
15. (   ) John Milton
16. (   ) Sir Thomas More
17. (   ) Samuel Pepys
18. (   ) William Shakespeare
19. (   ) Edmund Spenser
20. (   ) Thomas of Hales
21. (   ) John Wyclif

3.2 Grammar.
Sentence completion matching.

1. (   ) The (   ) is used after the saluta-
          tion of a friendly letter.
2. (   ) The (   ) is used after a request
          courteously worded in interroga-
          tive form.
3. (   ) The (   ) is used to indicate some
          sudden change in sense or gram-
          matical construction.
4. (   ) Use the (   ) to introduce a list,
          an illustration, or a long or formal
          quotation or statement.
5. (   ) Use the (   ) after an indirect
          question.
6. (   ) The (   ) is used to separate the
          items of an enumeration if they are
          subdivided by commas.
7. (   ) Use the (   ) to enclose some side
          remark that does not affect the
          structure of the sentence.

1. apostrophe
2. colon
3. comma
4. dash
5. exclamation point
6. parenthesis
7. period
8. quotation marks
9. semicolon

Column matching.

1. (   ) The boy fell *down the stairs*.
2. (   ) He *was building* a house.
3. (   ) He lived on a street *where there was
          much traffic*.
4. (   ) I told him *to think the proposition
          over*.
5. (   ) *What he said* was worth hearing.

1. adjective clause
2. adverb clause
3. appositive
4. emphatic verb
   phrase
5. infinitive clause
6. noun clause

6. (   ) The boy *who tells the truth* is   7. prepositional phrase
trusted.   used adverbially
7. (   ) Danny, *the boy detective,* has a hard   8. prepositional phrase
job.   used objectively
                                             9. progressive   verb
                                                phrase

3.3 English word usage.

Directions. Match the words at the left with the synonym at the right by placing the number of the synonym in the parentheses in front of each word.

1. (   ) monastery   1. abash
2. (   ) story   2. abbey
3. (   ) meditate   3. ancestor
4. (   ) confuse   4. anecdote
5. (   ) hatred   5. animosity
6. (   ) forefather   6. brazen
7. (   ) dog   7. canine
8. (   ) whim   8. caprice
9. (   ) shameless   9. cavity
10. (   ) dress   10. contemplate
                                     11. costume

4. Foreign languages.
4.1 Latin.
Column matching—*Illustrating quotations and translations.*

1. (   ) nunc aut numquam   1. always faithful
2. (   ) multum in parvo   2. always the same
3. (   ) per aspera ad astra   3. deeds, not words
4. (   ) sic semper tyrannis   4. for the public good
5. (   ) pro bono publico   5. fortune aids the brave
6. (   ) tempus fugit   6. much in little
7. (   ) fortes fortuna iuvat   7. now or never
8. (   ) facta, non verba   8. through difficulties to
9. (   ) semper fidelis   the stars
10. (   ) errare est humanum   9. thus ever to tyrants
                                     10. time flies
                                     11. to err is human

4.2 French.
Column matching.

1. (   ) naître   1. corner
2. (   ) tomber   2. neighbor

3. (   ) numéro
4. (   ) bientôt
5. (   ) coin
6. (   ) voisin
7. (   ) mille

3. number
4. only
5. soon
6. thousand
7. to be born
8. to fall
9. twenty-second

4.3 German.
Column matching—Illustrating pronouns and grammatical forms.

1. (   ) dieser
2. (   ) jedem
3. (   ) solchen
4. (   ) jene
5. (   ) welches

1. masculine   accusative singular
2. masculine   nominative singular
3. neuter dative singular
4. neuter genitive singular
5. nominative plural
6. nominative singular

4.4 Spanish.
Column matching.

1. (   ) spelling
2. (   ) underline
3. (   ) to work
4. (   ) truth
5. (   ) library
6. (   ) furniture

1. almohada
2. biblioteca
3. muebles
4. ortografía
5. subrayar
6. tocador
7. trabajar
8. verdad

Sentence completion matching.

1. (   ) El río más grande de la América del Sur es (   ).
2. (   ) La ciudad más importante de la América del Norte es (   ).
3. (   ) La ciudad más grande de la América del Sur es (   ).
4. (   ) ¿ En qué país se habla español en la América del Norte (   )?

1. El Río de las Amazonas
2. Méjico
3. Montevideo
4. New York City
5. Río Cauca
6. Río de Janeiro
7. Río Salado
8. San Pablo

5. Home economics.
Sentence completion matching—Illustrating foods.

1. (   ) Food given to prevent rickets is (   ).

1. butter
2. cereals

2. (   ) Food given to prevent scurvy is (   ).   3. cod-liver oil
     4. orange juice
3. (   ) Supplementary food given at five months is (   ).   5. spinach
     6. zweibach

Illustrating habits.

1. (   ) Regular feeding can be established at (   ).   1. eighteen months
     2. six months
2. (   ) Regular bowel elimination can be established at (   ).   3. three months
     4. three years
3. (   ) Regular urine elimination can be established at (   ).   5. twenty-four months
     6. two weeks

Column matching.
Illustrating colors.

1. (   ) Primary colors.   1. blue, green
2. (   ) Cool colors.   2. orange, violet, green
3. (   ) Monochromatic harmony.   3. red, green
4. (   ) Intermediate colors.   4. red, yellow, blue
5. (   ) Complementary colors.   5. tan, brown, dark brown
     6. yellow-orange, red-violet

Illustrating menus.

1. (   ) The best breakfast menu for a growing girl twelve to fourteen years old.   1. banana, oatmeal-milk, muffin-butter.
2. (   ) The best breakfast menu for a lumberman.   2. banana, cream of wheat-cream, hot cakes-syrup, coffee-cream-sugar.
3. (   ) The best breakfast menu for Grandfather.   3. orange juice, cod-liver oil, wheatena with top milk, toast-butter, milk to drink.
4. (   ) The best breakfast menu for a thin college girl.   4. soft-cooked egg, toast, coffee with cream.
5. (   ) The best breakfast menu for a child three to four years old.   5. stewed fruit, milk toast, egg, butter, jam, coffee-sugar.

6. Mathematics.
6.1 Algebra.
Sentence completion matching.

1. (   ) The volume of a box is (   ).   1. $4A$
2. (   ) The area of a circle is (   ).   2. $\frac{1}{2}AB$
3. (   ) The area of a triangle is (   ).   3. πr^2

4. (   ) The perimeter of a square is (   ).   4. $2\pi r$
5. (   ) The volume of a cube is (   ).   5. A^3
                                                       6. L.W.H.

Column matching.

1. (   ) $(x - y)(x - y)$ 1. $x^2 - y^2$
2. (   ) $(x - y)(x + y)$ 2. $x^2 - 2xy + y^2$
3. (   ) $(x + y)(x + y)$ 3. $4ax - 2ay$
4. (   ) $(2x - 2y)(2x - 2y)$ 4. $x^2 + 2xy + y^2$
5. (   ) $(x - 3)(x - 3)$ 5. $x^2 - 6x + 9$
                                                       6. $4x^2 - 4x + 1$

6.2 Geometry.
Sentence completion matching.

1. (   ) A parallelogram has two pairs of   1. acute
         (   ) sides.   2. bisector
2. (   ) A rhombus has (   ) sides.   3. congruent
3. (   ) A parallelogram which has all angles   4. equal
         right angles is called a (   ).   5. oblique
4. (   ) A square has (   ) angles and (   )   6. parallel
         sides.   7. parallelogram
5. (   ) If a quadrilateral has two pairs of   8. rectangle
         opposite sides equal, the figure is a   9. right
         (   ).   10. similar
6. (   ) The triangles formed by the diagonal   11. square
         of a parallelogram are (   ).   12. unequal
7. (   ) The opposite angles of any parallel-
         ogram are (   ).
8. (   ) Each diagonal of a parallelogram is
         the (   ) of the other.

Column matching.

1. (   ) A part of a circle.   1. altitude
2. (   ) A polygon of four sides.   2. arc
3. (   ) Side opposite the right angle of a   3. bisector
         right triangle.   4. chord
4. (   ) A polygon whose vertices are on a   5. hypotenuse
         circle.   6. hypothesis
5. (   ) A line that divides a line or angle   7. inscribed polygon
         into two equal parts.   8. locus
6. (   ) Part of a theorem which tells what is   9. median
         given.   10. pentagon
7. (   ) Perpendicular distance from vertex   11. perpendicular
         to opposite side.   12. quadrilateral

8. (   ) A polygon of five sides.
9. (   ) Line which forms a 90° angle with another line.
10. (   ) An extended chord.
11. (   ) Line from vertex to opposite side at mid-point.
12. (   ) A line whose ends are on the circle.
13. (   ) A line that touches a circle at only one point.
14. (   ) An equilateral parallelogram with oblique angles.
15. (   ) That which satisfies a given geometric condition.

13. rhombus
14. secant
15. tangent

Column matching with diagrams.

Directions. The word or words in the left column below are the correct names of the various geometric figures and lines in the right-hand column below. Put on the blank line beside each word or group of words the number of the geometric figure or line for which it is the correct name.

1. (   ) straight angle
2. (   ) broken line
3. (   ) complementary angles
4. (   ) circles tangent internally
5. (   ) central angles
6. (   ) acute angle
7. (   ) circumscribed circle
8. (   ) inscribed angle
9. (   ) supplementary angles
10. (   ) adjacent angles
11. (   ) vertical angles
12. (   ) reflex angle
13. (   ) right angle
14. (   ) obtuse angle
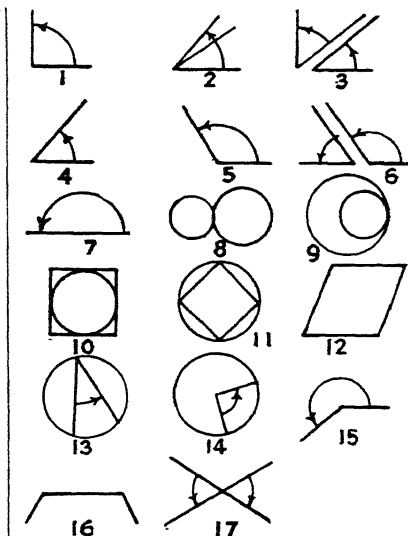
7. Manual training.
Column matching.

Uses	Tools
1. ( ) Folding device for measuring.	1. block plane
2. ( ) Planing end grain on small pieces.	2. brace
3. ( ) Planing long board edges.	3. chisel
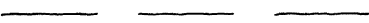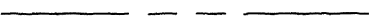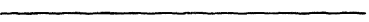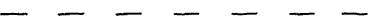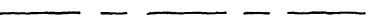
4. (   ) Cutting with grain of wood.   4. jack plane
5. (   ) Making mortises.   5. rip saw
     6. rule

Using illustrations.

Directions. Below are a number of lines and their names, not arranged in proper order. After the name of each line, in the parentheses to the right, write the correct number of the line.

		Correct No.
The Lines	*The Names*	*of the Line*
1. ←——— ———→	A. Border line.	( )
2. ——— ——— ———	B. Center line.	( )
3. ——— — — ———	C. Cutting line.	( )
4. ———————————	D. Dimension line.	( )
5. — — — — — — —	E. Drawing line.	( )
6. ———————————	F. Extension line.	( )
7. ——— — ——— — ———	G. Hidden line.	( )

8. Music.

Sentence completion matching.

1. (   ) (   ) is called the "father of symphony."   1. Beethoven
2. (   ) (   ) wrote some of his best works after   2. Grieg
     becoming deaf.   3. Handel
3. (   ) The greatest child prodigy in music ever   4. Haydn
     known was (   ).   5. Herbert
4. (   ) (   ) wrote the *Messiah.*   6. Mozart
5. (   ) (   ) composed the opera *Lohengrin.*   7. Schubert
   8. Tschaikowsky
   9. Wagner

Column matching.

Names		Country
(*Sample*) A. (5) Brahms		1. Bohemia
1. ( ) Wagner		2. England
2. ( ) Grieg		3. Finland
3. ( ) Paderewski		4. France
4. ( ) Verdi		5. Germany
5. ( ) Rossini		6. Italy
6. ( ) Donizetti		7. Poland
7. ( ) Beethoven		8. Russia
8. ( ) Liszt		9. Spain
		10. Sweden
		11. United States

9. Science.
9.1 Agriculture.
Sentence completion matching.

1. (   ) The leading crop of Oklahoma is (   ).   1. alfalfa
2. (   ) The crop ranking second in importance in   2. broom corn
the United States is (   ).   3. corn
3. (   ) What is a profitable upland crop in Okla-   4. cotton
homa?   5. oats
4. (   ) An Oklahoma crop exported largely through   6. wheat
New Orleans is (   ).
5. (   ) What crop is classed as a leguminous crop?

Column matching.

1. (   ) Cheviot   1. chicken
2. (   ) Berkshire   2. cow
3. (   ) Buff cochin   3. goat
4. (   ) Ayrshire   4. hog
5. (   ) Clydesdale   5. horse
                                                          6. sheep

9.2 Biology.
Sentence completion matching.

1. (   ) The white of the egg is called (   ).   1. albumin
2. (   ) The paramecium has organs of locomotion   2. cilia
which are called (   ).   3. conjugation
3. (   ) The cell is composed largely of (   ).   4. cytoplasm
4. (   ) The grasshopper has breathing organs which   5. ganglion
are called (   ).   6. spiracles

Column matching.

1. (   ) Circulation of blood.   1. Burbank
2. (   ) Laws of heredity.   2. Darwin
3. (   ) Vaccination for smallpox.   3. Harvey
4. (   ) Organic evolution.   4. Jenner
5. (   ) Study of fermentation.   5. Mendel
                                                          6. Pasteur

Parts of an illustration.

Directions. The following diagram represents a paramecium. Place the number of the organ on the diagram in the blank in the left-hand column before the correct name of the organ.

1. (   ) Cilia
2. (   ) Trichocyst
3. (   ) Nucleus
4. (   ) Protoplasm
5. (   ) Oral groove
6. (   ) Food vacuole
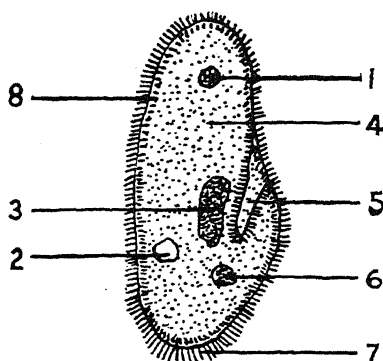
9.3 Chemistry.
Sentence completion matching.

1. (   ) Carbon unites with (   ) to form car-   1. chlorine
         bon dioxide.   2. hydrogen
2. (   ) An element appearing in acids that   3. iodine
         may be replaced by metals is (   ).   4. nitrogen
3. (   ) The element that boils off first upon   5. oxygen
         boiling liquid air is (   ).   6. sulphur
4. (   ) What element is often used as a bleach-
         ing agent?
5. (   ) The halogen contained in tincture of
         iodine is (   ).

Column matching.

1. (   ) Sodium bicarbonate   1. $CaCO_3$
2. (   ) Gypsum   2. $CaSO_4$
3. (   ) Sal soda   3. $MgSO_4$
4. (   ) Epsom salts   4. Na_2CO_3
5. (   ) Marble   5. $NaHCO_3$
                                                       6. Na_2SO_4

9.4 Physics.
Sentence completion matching.

1. (   ) Gravity causes an acceleration of (   )   1. 39.37
         cms. per second per second.   2. 40.02
2. (   ) One meter is equal to (   ) inches.   3. 62.4
3. (   ) The density of water is (   ) lbs. per   4. 980
         cu. ft.   5. 1,000
4. (   ) One kilogram is equivalent to (   )   6. 1,648
         grams.

Identification of laws.

1. ( ) Every particle in the universe attracts every other particle with a force directly proportional to the product of the two masses and inversely as the square of the distance between them.
2. ( ) Under the same conditions of temperature and pressure, equal volumes of all gases contain an equal number of molecules.
3. ( ) At a constant temperature the product of pressure and volume of a constant mass of a gas is constant.

1. Archimedes' Law
2. Avogadro's Law
3. Boyle's Law
4. Lenz's Law
5. Newton's Law
6. Torricelli's Law

Column matching—Formulas.

1. ( ) Gravity
2. ( ) Gases
3. ( ) Electricity
4. ( ) Weight per unit volume

1. $D = \dfrac{M}{V}$
2. $I = \dfrac{E}{R}$
3. $I = RP$
4. $\dfrac{P_1}{P_2} = \dfrac{V_2}{V_1}$
5. $S = \frac{1}{2}gt^2$
6. $V = H \times A$

10. Social sciences.
10.1 Civics—Column matching.

1. ( ) Highest court in the United States.
2. ( ) City powers are granted by
3. ( ) Large businesses united to control prices or supply of material.
4. ( ) Articles of Confederation adopted by
5. ( ) A court suit is the process through which to obtain

1. civil and criminal
2. Congress
3. damages
4. justice
5. monopoly
6. nation
7. state
8. state legislatures
9. U. S. Supreme Court

10.2 Government—Column matching.
Comparing characteristics and stages of civilization.

1. ( ) Migration.
2. ( ) Land ownership.

1. agricultural stage
2. handicraft stage

3. (   ) Use of power and machinery.   3. industrial stage
4. (   ) Rise of factory system.   4. pastoral or nomadic stage
5. (   ) Making things by hand.
6. (   ) Organization of guilds.

Comparing men and their activities.

1. (   ) Father of the Constitution.   1. Adams
2. (   ) Defender of the League of   2. Burke
         Nations.   3. Clay
3. (   ) Author of the Connecticut   4. Davis
         Compromise.   5. Franklin
4. (   ) Founder of the first National   6. George
         Bank.   7. Jackson
5. (   ) Prime Minister of Great   8. Jefferson
         Britain.   9. Lincoln
6. (   ) Author of *Poor Richard's*   10. Madison
         Almanac.   11. Penn

Sentence completion matching.

1. (   ) In all cases affecting ambas-   1. Cabinet
         sadors, the (   ) has original   2. Congress
         jurisdiction.   3. Court of Appeals
2. (   ) To declare punishment for   4. District Court
         treason is the power of the   5. House of Representatives
         (   ).   6. people
3. (   ) The election of Members of   7. President
         the House of Representa-   8. Senate
         tives is judged by the (   ).   9. Supreme Court
4. (   ) To try impeachments is the
         power of the (   ).
5. (   ) Punishment of the Members
         of the Senate is the duty of
         the (   ).

10.3 History.
Column matching—Comparing men and events.

1. (   ) Floated down Mississippi   1. Bienville
         River to its mouth.   2. Cabot
2. (   ) Explored in America for   3. Columbus
         England.   4. Coronado
3. (   ) Discovered America.   5. Cortez
4. (   ) Explored in Canada for   6. De Soto
         France.   7. George Catlin

5. (   ) Founded New Orleans.
6. (   ) Conquest of Mexico and Peru.
7. (   ) Searched for "Seven Cities."
8. (   ) An artist who visited Oklahoma.
9. (   ) Explored the Louisiana Purchase.
10. (   ) Explored Gulf States for Spain.
11. (   ) Explored Louisiana for the United States.

8. John Payne
9. Joliet and Marquette
10. La Salle
11. Lewis and Clark
12. Thomas Jefferson
13. Wilkinson
14. Zebulon Pike

Variation in form.

Although the following is not in keeping with the rules generally accepted for matching, it offers an interesting variation and gets all responses to the left.

Directions. Place all the numbers of the events to the left of the name connected with the events.

Persons		*Events*
1. ( )		1. Annual taxes and Mutiny Act.
2. ( )		2. Bank of England established.
3. ( )	Charles I	3. Bill of Rights signed.
4. ( )		4. Corn-Law League.
5. ( )		5. Declaration regulating sports.
6. ( )		6. Emigration from Ireland to America.
7. ( )	Oliver Cromwell	7. Execution of Charles I.
8. ( )		
9. ( )		8. Expulsion of Long Parliament.
10. ( )		9. Hampden's case.
11. ( )		10. Influence of Buckingham.
12. ( )	William and Mary	11. Instrument of Government.
13. ( )		12. Irish famine.
14. ( )		13. Massacre of Glencoe.
15. ( )		14. Period of absolutism.
16. ( )		15. Petition of Rights signed.
17. ( )	Victoria	16. Pride's Purge.
18. ( )		17. Reform Bill of 1832.
		18. Toleration Act.

Another form which also varies from usual rules.

Another interesting form applicable to many subjects is a matching form[2] similar to the Master-List described by Tyler.[3]

Directions. In the first column below are a number of causes of revolutions. In the second column are the four revolutions which were the effects of these causes. In the parentheses to the right of the revolutions place the numbers of the various causes that brought about that revolution. A certain cause may match more than one revolution, while some may not match any. It may not be necessary to fill all the parentheses.

The Causes	Revolutions	Cause Nos.
1. Burden of taxation on the peasants.		( )
2. Navigation laws.		( )
3. Activity of the Parliaments.		( )
4. Increase of property qualifications for voting.		( ) ( )
5. Civil War in the United States.	A. French Revolution	( )
6. Breakdown of the Old Regime.		( )
7. The king was the only one who could propose laws.		( ) ( )
8. The Stamp Act.		( )
9. The evils of the Guild System.		( )
10. Lettres de Cachet.		( )
11. Privileges of the nobility.	B. American Revolution	( )
12. Excessive luxuries of the royalty.		( )
13. Trade laws.		( )
14. Many new inventions.		( )
15. Censorship of the press.		( )
16. Upper classes exempt from taxation.	C. Revolution of 1830	( )
17. The people were learning to act together.		( )
18. Prosperity and enlightenment of the people.		( )
19. The awakening of China.		( )
20. Despotism of Charles X.		( )
21. Weakness of Louis XVI.	D. Industrial Revolution	( )
22. The people had gained confidence in their ability to gain victory.		( )

[2] Rinsland, Henry D., and Fullerton, Byron, First Semester Test, in Robinson and Breasted, *European History*, Bureau of Educational Research, University of Oklahoma, 1925.

[3] Tyler, Ralph W., *Constructing Achievement Tests*, Ohio State University, 1934. pp. 41–51.

Sentence completion matching.

1. (   ) The Persian Empire
   was completely con-
   quered by (   ).
2. (   ) Constantinople, the
   new capital of the Ro-
   man Empire, was
   founded by (   ).
3. (   ) The Latin translation
   of the *Bible*, known as
   the *Vulgate*, was
   compiled by St. (   ),
   a Latin Father.
4. (   ) The last strong Mero-
   vingian was named
   (   ).
5. (   ) In the year 800, (   )
   was crowned Emperor
   of the Frankish State.

1. Alexander
2. Ambrose
3. Charlemagne
4. Constantine
5. Dagobert
6. Jerome
7. Justinian
8. Lothair
9. Martel
10. Vandals
11. Vikings

Alternative Response

Definition. An *alternative-response* type of test is a testing situation in which a student chooses one of two responses. One of the best known forms is the true-false test. Alternative response also measures situations where two possible answers are given and the student chooses one; as, *It is* (*I, me*).

Since there is no way of knowing whether a student answered a given question because he knew it or because he guessed correctly, this form is not useful for careful diagnosis. Few samples will be given in the elementary subjects, since true-false is probably not a good form for little children. It is satisfactory for older students and especially those in college, where time is to be saved in covering a great deal of material in a short time and students should know a large body of material including misinformation as well as correct information.

I. Rules for Constructing Alternative-Response Items

1. Statements should be "out and out" true or false. If a true statement is, "56% of the cases . . . ," and this is to be worded as a false statement, the number should vary from 56 considerably.

2. Avoid long expressions except with older high school students or college students.

3. Ambiguous statements are misleading and are not necessary for a good test.

4. Avoid the use of double negatives except for mature students. The use of double negatives creates reading difficulty, and reading, instead of subject-matter knowledge in a given field, may be measured.

5. Trick or catch questions, such as using "B. C." instead of "A. D." for dates in a test in American history, should be avoided.

6. Trivial statements seldom lend themselves to any form of measurements. They should be avoided.

7. Do not have part of the statement true and part false. This is not an alternative testing situation.

8. Do not have the response of one statement based on the response of another statement.

9. Avoid suggestive statements.

10. Avoid determiners,[1] which in a large majority of cases make the statement true or false. Some of these are: *totally, entirely, completely, solely, fully, absolutely, always, never*, and *exclusively*. These almost always make statements false. Indications of degree or comparison are more often true. Long statements of over twenty words tend to be true about three-fourths of the time. If determiners are used, use each in both true and false statements.

11. The wording of alternative-type responses must be adapted to the educational status of the students measured. Use the language of the group measured, but always observe the rules of grammar.

12. Never require students to write the words *True* and *False, Yes* and *No*. If any writing is required, call for the simple T or F, Y or N, asking students to make two lines for the T and three lines for the F. Some writers suggest the use of + and 0.

13. A simple form for having students record responses is to print the T and F, or Y and N, and direct the student to encircle his choice.

14. Since the student does no writing, typed or printed lines in an alternative-response type may be single-spaced.

15. When an alternative situation consists of the choice of one of two words, the words may be numbered 1 and 2, one of these numbers to be chosen and placed in parenthesis in front of the sentences, as:

1. (   ) It is (1 *I*, 2 *me*).
2. (   ) (1 *Sit*, 2 *Set*) the book on the table.

---

[1] The student desiring to examine a larger list of determiners and to study their relative effect on the truthfulness or falsity of statements should consult Brinkmeier, I. H., and Keys, N., "Circumstantiality as a Factor in Guessing on True-False Examinations," *Journal of Educational Psychology*, Vol. 21 (December, 1930), pp. 681–694; Brinkmeier, I. H., and Ruch, G. M., "Minor Studies in Objective Examination Methods: III—Specific Determiners in True-False Statements," *Journal of Educational Research*, Vol. 22 (September, 1930), pp. 110–118; and Weideman, C. C., "The Omission as a Specific Determiner in the True-False Examination," *Journal of Educational Psychology*, Vol. 22 (September, 1931), pp. 435–439.

16. If responses are placed to the left of the sentences, students will never cross or mark the wrong response. When the lines are irregular and the responses follow the sentences, wrong letters are often checked.

17. The number of T's and F's, or Y's and N's, should be about the same.

18. Rules for writing directions. Always tell what is given and what the student is to do.

If the test is true-false and the T's and F's are printed in front of each statement, something like the following will be understood:

Directions. Below is given a number of statements; some are true and some are false. If a statement is true, circle the T; but if the statement is false, circle the F.

19. Rules for scoring. There are two general plans for scoring a true-false test: First, score the number of correct responses; second, score the right responses minus the wrong responses. A more complete discussion of scoring the alternative response is given in Chapter IX, page 269, where the formula *right minus wrong* is suggested for giving the most valid score. Counting the number of correct responses is simpler and just as reliable. If students are directed to answer first all questions they know and then to go back and make their best guess, they are following a very practical rule of life. They are counted points for guessing correctly and they do not gain anything by guessing incorrectly. Many decisions of life are based on guessing. Many true-false questions in a given subject will not be answered by pure guess because the student usually knows something about the subject matter, although, occasionally, there is a pure guess concerning simple information. No serious error in scores will occur if the number of correct responses is counted and the test made long instead of short. Probably no true-false test, standing by itself, should ever be less than 100 statements in length; but when counted with other tests, as is recommended in the chapter on grading, an occasional true-false quiz of 25 items will give very satisfactory results. If all students complete a true-false test, the correlation between the scores by the two methods of scoring is perfect, and, therefore, the score by simply counting the number of right responses is to be preferred. As has been pointed out by a number of writers, the method of scoring is not the important idea. In

Chapter IX are reviewed some of the statistical studies relative to scoring true-false and other alternative-response questions. Research has yielded a general device that will usually give the highest reliability and validity. The results of unpublished studies of the Bureau of Educational Research of the University of Oklahoma seem to indicate that the following is the best plan:

1. Recommend that students answer all questions they know.

2. Recommend that after these are answered, students make their best guess for all other items.

3. Score the number of correct responses.

20. Scoring keys. Many different mechanical devices for scoring have been proposed. One of the simplest is to perforate, with a round punch, the T's or the F's on a copy of the test. The column containing the numbers of the items, the T's, and the F's may be pasted on cardboard. When it is punched, all that is necessary in scoring is to place the punched cardboard directly over the student's answers and look through the holes. If the T or F is crossed or underlined, the correct and incorrect answer will be seen in the hole for the item. Both correct and incorrect answers may be counted. Scoring is as rapid as counting.

II. Samples of Alternative-Response Tests in Elementary School Subjects

1. Arithmetic.

1. T F Twenty-seven cubic feet equal one cubic yard.
2. T F The number of pounds in a bushel depends upon the product to be measured.
3. T F There are five pecks in one bushel.
4. T F There are thirty days in every month.
5. T F Two pints equal one quart.
6. T F There are two thousand pounds in one ton.
7. T F Thirty-six inches equal one yard.
8. T F Every fifth year is leap year.
9. T F Six and two-thirds yards equal one rod.
10. T F Three feet equal one yard.

2. Art.

1. T F Orange is made by mixing purple and yellow.
2. T F Fresco is a painting on freshly spread wet paint.
3. T F An etching is an engraving by means of a pointed instrument for the purpose of making a print.

4. T F A frieze is a type of painting.

5. T F The term *doric* refers to the shaft of a column.

3. English.
3.1 Grammar.

Directions. Identify the part of speech of the underscored word by placing the number 1 or 2 in front of each statement.

1. (   ) You are going with me. (1 noun, 2 pronoun)

2. (   ) Please look at their house. (1 noun, 2 pronoun)

3. (   ) The white horse is lovely. (1 adjective, 2 adverb)

4. (   ) We shall surely go. (1 adjective, 2 adverb)

3.2 English usage.

1. (   ) Mary and John (   ) going to school. (1 was, 2 were)

2. (   ) There (   ) my old friends, the Browns. (1 are, 2 is)

3. (   ) The rebel chief, with all his attendants, (   ) been captured. (1 has, 2 have)

4. (   ) It is hard to decide (   ) song was the best. (1 whose, 2 whom)

Note. There are several ways of mechanically arranging items, as illustrated above in 3.1 and 3.2, but the directions as to what is given and what the student is to do should always be clear.

4. Music.
1. T F A saxophone is a stringed instrument.
2. T F The viola is a small-sized violin.
3. T F Mutes are used only with stringed instruments.
4. T F The cello has five strings.
5. T F Oboes have sounding posts.
6. T F The concert master generally plays the harp.
7. T F The total number of flats in music is seven.
8. T F Monotones are people who have wonderful voices.

5. Physiology.
1. T F The amount of water in the body is constant.
2. T F Tobacco contains a powerful poison called *nicotine*.
3. T F Our daily diet should contain liberal portions of fresh green vegetables.
4. T F Rest and sleep are not needed to remove the poisons of fatigue.

5. T   F   A quarantine is established to prevent the spread of contagious diseases.

6. Reading.

1. T   F   A little Red Hen lived in the woods.
2. T   F   The fox went to the Red Hen's house.
3. T   F   The little Red Hen was happy to see him.
4. T   F   A sly fox lived with the Red Hen.
5. T   F   Little Red Hen took the bag.
6. T   F   Little Red Hen cut a hole in the bag.

Such sentences as the above may be used to test thought content in the reading lesson.

7. Social science.
7.1 Civics.

1. (   ) The United States has been trading with China since the Revolutionary War.
2. (   ) No definite steps were taken to build the Panama Canal until the War with Spain.
3. (   ) The Panama Canal was opened by the United States in 1912.
4. (   ) Cuba came under the protection of the United States after the annexation of Texas.
5. (   ) The Carribbean area is under the control of the United States.
6. (   ) Spain was deprived of the last of her once vast possessions in the New World by the Mexican War.
7. (   ) The Philippine Islands were purchased from Spain for three thousand dollars.
8. (   ) The United States acquired Hawaii by annexation.
9. (   ) The Nineteenth Amendment gave women the right to vote.
10. (   ) A famous statement made by Woodrow Wilson was, "Give me liberty or give me death."

Note. In the above sample the student would be directed to place a T or an F in front of each statement.

7.2 Geography.

1. T   F   A wharf is a place where boats land.
2. T   F   Ocean steamers can go up the Tigris River.
3. T   F   Arabia is an island.
4. T   F   Mesopotamia is a cold country.

5. T F Near the Tigris and the Euphrates are the ruins of ancient cities.
6. T F Many sheep are raised in Wyoming, Montana, and Colorado.
7. T F The water of the Great Lakes is salty.
8. T F Detroit is noted for its automobile industry.
9. T F Bagdad has many different nationalities of people.
10. T F A group of people called Arabs live in Mesopotamia.

7.3 History.

1. T F The Santa Fe Trail started at Kansas City, Missouri, and ended at Santa Fe.
2. T F *The Cherokee Advocate*, weekly newspaper printed by the Cherokee Nation, had the news printed in English and Cherokee.
3. T F The first governor of Oklahoma was Thomas P. Gore.
4. T F The first railroad to enter Oklahoma was the Chicago-Rock Island and Pacific in 1889.
5. T F Geronimo was a noted Apache chief.

8. Spelling.

1. T F abhorr
2. T F advice
3. T F separate
4. T F alltogether
5. T F alumium   .
6. T F allways
7. T F ambasador
8. T F analyze
9. T F uncle
10. T F asparagus

Note. In the above sample, the letters C and I could be substituted for T and F. Perhaps such abbreviations as C for correct and I for incorrect are better than T and F. Directions should be perfectly clear.

III. Samples in High School Subjects
1. Art.

1. T F Before the American Revolution, portraiture, largely borrowed from England, began to appear in the Colonies.
2. T F A man who could draw and color a portrait in the early history of American art was known as a *limner*.

3. T F Gilbert Stuart was the best portrait painter of all the early men.
4. T F Cole's landscapes did not carry the epic poem element in them.
5. T F Moran is known for his Western prairie landscapes.

2. Commercial.
2.1 Bookkeeping and law.

1. T F The purpose of analyzing transactions is to determine the proper titles to be debited and credited.
2. T F The trial balance is a check against errors of all kinds.
3. T F Every transaction affects at least two ledger accounts.
4. T F When goods are returned by a customer, his account is debited.
5. T F The ledger is a topically arranged record.
6. T F All increases in proprietorship are credits.
7. T F Assets are always represented by debits.
8. T F An error in the journal should be corrected by neatly erasing the mistake and then making the correct entry.

2.2 Shorthand and typing.

1. T F The carriage should be returned slowly and evenly.
2. T F There are three ribbon spools on a machine.
3. T F It is correct to space twice after a colon.
4. T F In order to obtain the highest rate of speed, the typist should sit erect with feet flat on the floor.
5. T F A hyphen is made with two dashes.
6. T F After the shift lock has been depressed, the machine will continue to make capital letters until the lock is released.

2.3 Bookkeeping.

Directions. Below are given statements of increases or decreases in accounts. If the account should be debited to designate the change, circle the D. If the account should be credited, circle the C.

1. D C All increases in assets.
2. D C All increases in liabilities.
3. D C All increases in proprietorship.
4. D C All increases in income.
5. D C All increases in expense.
6. D C All decreases in assets.
7. D C All decreases in liabilities.
8. D C All decreases in proprietorship.
9. D C All decreases in income.

3. English.
3.1 Grammar.

1. T   F   A noun is used as the subject of a sentence.
2. T   F   All sentences must have a subject and a predicate.
3. T   F   All proper nouns begin with a capital letter.
4. T   F   A question mark should be placed at the end of every sentence.
5. T   F   A period should be placed at the end of each sentence.
6. T   F   A comma is used for more than one thing in a sentence.
7. T   F   An abbreviation is a name.
8. T   F   A paragraph is more than a sentence.
9. T   F   We study language to improve our speech.

3.2 Grammar or usage.

A slight variation of the usual true-false form is given below.

Instructions. If the punctuation, word, or group of words following a number is correct, circle the T by that number at the left of the page; but if you find an error, circle the F by that number at the left of the page.

1. T   F   "Where is he (1) at?" (2) screamed Bobbie (3) when
2. T   F   he couldn't find his cousin.   (4) "I (5) can't hardly go
3. T   F   without him!" (6) he said, speaking to himself.   "The
4. T   F   (7) bunch want us to go with them to the (8) show.
5. T   F   Henry is going to have a (9) party for us (10) like he did
6. T   F   for John Quinn."
7. T   F
8. T   F
9. T   F
10. T   F

4. Foreign languages.
4.1 French.

Directions. Some of the following sentences are grammatically correct; others are not.   If the sentence is correct, mark *Yes* between the parentheses; if it is incorrect, mark it *No*.

EXAMPLES: *A.* (*yes*) Il voyage depuis deux mois.
            B. (*no*) Elle a parti il y a deux heures.

1. (   ) C'est beau temps.
2. (   ) Voilà le père de dix enfants.
3. (   ) Il faut que je le fasse.

4. (   ) Je veux que le président vien chez moi.
5. (   ) Jean est allé à l'école jusqu'à l'âge de seizeans.

4.2 Spanish.

1. T   F   Los guantes se llevan en los pies.
2. T   F   El español no se habla en Méjico.
3. T   F   La Argentina es una ciudad de la América del Sur.
4. T   F   El río de las Amazonas está en el Brasil.
5. T   F   La vaca es un animal útil.

In this sample the true-false or yes-no is used to determine the student's ability to translate a sentence. If he can translate the sentence, the answer is perfectly obvious, as it takes no subject-matter knowledge to know if the statement is true or false. This method of measuring translation has been widely used in standardized tests. However, it is not very valid and is in no way diagnostic, as the teacher never knows whether or not the student could translate the sentence or what part he could not translate.

4.3 Latin—Measuring translation.[2]

Directions. Read carefully the following Latin passage. Then read the English statements beneath the Latin, encircling the T to the left of the statement if the statement is true; the F, if the statement is false.

Antiqui Romani non solum patriam magnopere amaverunt sed etiam pro patria mortem libenter oppetiverunt.

Quondam magna rima medio in foro Romano apparuerat. Cur rima apparuit? Romani ignorabant; itaque terrebantur, quod iram deorum timebant. Primum saxa terramque paraverant et in rimam jactaverant. Sed frustra laboraverant. Rima tamen lata et alta manebat.

Denique a deis auxilium oraverant. Oraculum ita responderat: "Si in rimam maximum bonum vestrum jactaveritis, rima explebitur." Diu Romani dubitabant. Quid erat maximum bonum eorum? Nonne aurum et gemmae erant maximum bonum? Aurum igitur et gemmae in rimam jactabantur; sed frustra.

Apud Romanos erat Mettus Curtius, vir praeclarus. "Non frustra," inquit, "dei nos monuerint. Nam arma et animus interritus sunt maximum bonum nostrum. Non saxis et auro et gemmis, sed audacia animi populus Romanus servabitur. Romae et deis meam vitam nunc voveo."

Tum armatus in equum ascendit, et, dum turba Romanorum stupet, in rimam latam equitat. Statim rima expletur et Romani a cura et periculo servantur.

T　F　1. A great crevice once appeared in the middle of the Roman Forum.

T　F　2. The Romans immediately knew just why it appeared.

T　F　3. No one was in the least frightened.

T　F　4. They first threw rocks and earth into the crevice.

T　F　5. Later, the story goes on to tell us, they threw in bricks and trees.

T　F　6. At last they asked aid of the gods.

T　F　7. The oracle assured them that if they would throw into the crevice their most prized possession, the crevice would be filled.

T　F　8. The Romans asked Mettus Curtius to sacrifice his life for their safety.

T　F　9. He dismounted from his horse and jumped into the crevice.

T　F　10. The Romans were saved by the bravery of Mettus Curtius.

5. Home economics.

1. (　) Each member of the "modern home of today" should be allowed to do exactly as he pleases.

2. (　) That each member of the home be trained according to his interests, needs, and capacities should be the goal of every home.

3. (　) Good family life provides satisfaction for the members of the family.

4. (　) A high school girl busy with schoolwork and outside activities should not have to care for her own room.

5. (　) Lasting family happiness is obtained through the luxuries money can buy.

6. (　) The responsibility for using the family income belongs to the father.

7. (　) Worry and nagging of one member is apt to destroy the harmony of a family group.

8. (　) The community should co-operate with the family in projects for advancement in education and social life.

9. (　) Children will have as much affection for the father who comes home from work tired and cross and sits down to read the newspaper as they have for their mother.

10. (   ) Companionship with the children is considered an essential
for successful and enduring relationships of father and child.

Note. As written, the above form demands that the student
write the letter T or F in front of each statement.   Directions
should be clear that this is what is to be done.

6. Mathematics.

6.1 Algebra.

1. T   F   A term may be taken from one member of an equation and
placed in the other member of the equation.
2. T   F   The product of the sum and difference of two numbers
equals the difference of their sums.
3. T   F   The exponent of any letter is the sum of the exponents of
that letter in the separate factors.
4. T   F   An algebraic statement which shows that a certain number
balances or is equal to some other number is an equation.
5. T   F   If $A = BH$, then $B = AH$.
6. T   F   If 4 is added to a certain number, the result will be 16.
The equation should be $4m = 16$.
7. T   F   An equation is the same as a formula.
8. T   F   The sign of the answer when A is multiplied by $-B$ is
positive.
9. T   F   The square of X can never be equal to X nor smaller than
X.
10. T   F   The value of the fraction N/D will increase if D remains
fixed and N increases.

6.2 Geometry.

1. T   F   If equals are added to equals, the sums are not equal.
2. T   F   The whole is equal to the sum of all of its parts and greater
than any of its parts.
3. T   F   The sum of all angles formed at a point on a line and on one
side of a line is a straight angle.
4. T   F   A perpendicular erected at the mid-point of the base of an
isosceles triangle passes through the vertex but does not
bisect the vertical angle.

7. Manual training.

1. T   F   All drawings should be inked.
2. T   F   Tracings inked with red lines make good blue prints.
3. T   F   Dot-dash lines are used for dimension lines.

4. T   F   A hard pencil is best for lettering.
5. T   F   The development of a cylinder is a rectangle.

8. Music.

1. T   F   The scale of C minor has three flats.
2. T   F   The leading tone triad in major is major.
3. T   F   A quarter note triplet in ¾ measure gets one beat.
4. T   F   Wagner wrote in the romantic period.
5. T   F   The tympani are in the brass section of the symphony orchestra.

9. Science.
9.1 Agriculture.

1. T   F   Many soils in Oklahoma are deficient in nitrogen, phosphorus, or potassium.
2. T   F   It is well to have a legume in a rotation grown for green manure because of the nitrogen which is added to the soil.
3. T   F   Alfalfa has a shallow root system.
4. T   F   The grain sorghums are hot-weather crops and require more moisture than corn.

9.2 Biology.

1. T   F   All insects are harmful.
2. T   F   Only plants containing chlorophyl manufacture food.
3. T   F   Plants grow by increasing the size of their cells.
4. T   F   Leaves breathe through openings called *mesophyll*.
5. T   F   There are three different enzymes in pancreatin.
6. T   F   A fruit is a matured ovary.
7. T   F   Loss of oxygen is the primary cause of a plant's wilting.
8. T   F   Propagation and reproduction mean the same thing.
9. T   F   A complete flower has both essential and accessory parts.
10. T   F   Wheat rust is a fungus disease.

9.3 Chemistry.

1. T   F   Cavendish discovered oxygen.
2. T   F   Liquid oxygen represents an element.
3. T   F   The symbol for cobalt is the same as the formula for a poisonous gas.
4. T   F   One atom of iron is represented exactly as one molecule of iron is.
5. T   F   Metallic oxides are basic anhydrides.
6. T   F   The molecular weight of NaCl is 89.

7. T F Boyle's Law and Avogadro's Hypothesis really mean the same thing.
8. T F Burning wood represents a chemical change.
9. T F The valence of manganese in potassium permanganate is plus seven.
10. T F All salts contain a metal and acid radical.

9.4 Physics.

1. T F It will require 5.1 seconds for a man to fall to the earth from an airplane which is 2,000 feet high, if we disregard friction.
2. T F Sir Humphrey Davy invented the spectroscope.
3. T F All gases occupy the same volume under equal pressure and varying temperature.
4. T F Sir Isaac Newton gave us the laws of gravitation.
5. T F One liter of water weighs one kilogram if weighed under standard conditions.
6. T F The formula $D = M/V$ is used in determining moments of force about a point.

10. Social science.
10.1 Civics.

1. T F Congress is bicameral.
2. T F The judicial department functions in law-enforcing.
3. T F Right to own property is a civil right.
4. T F A senator must be a natural-born citizen.
5. T F Arson is an act of stealing.
6. T F Congress can pass *ex post facto* laws.

10.2 Government.

1. T F The Articles of Confederation bestowed little attention upon the executive branch of the government.
2. T F North Carolina was the last of the thirteen states to ratify the Constitution.
3. T F The purpose of the Convention of 1787 was to revise the Articles of Confederation.
4. T F The Constitution is distinctive not only for what it contains, but also for what it omits.
5. T F The Constitution contained many wholly new principles.
6. T F There are four alternative methods of putting an Amendment through.

7. T F The "Lame Duck" Amendment provides for the election of senators.

10.3 History.

1. (   ) The Anglo-Venezuelan difficulty was a dispute between Venezuela and the British colony of Guiana.
2. (   ) At the time of this dispute, the Monroe Doctrine was recognized by foreign nations as a part of international law.
3. (   ) The people of England and America were anxious for a war between England and the United States.
4. (   ) The dispute was settled by arbitration in favor of Venezuela.
5. (   ) Spain's government of Cuba was designed to exploit the Cuban natives both politically and economically.
6. (   ) The Cubans felt the taxes imposed upon them to be both unfair and excessive.
7. (   ) The United States sympathized with the Cuban Revolt because our important trading interests were in danger.
8. (   ) It has been proved that Spanish agents were responsible for the U. S. S. Maine disaster in Havana Harbor.
9. (   ) The United States Army was more prominent in the Spanish-American War than the Navy.
10. (   ) Europe believed that the United States would exercise control over Cuba only long enough for the Cubans to establish law and order.

Miscellaneous Forms

Definition. Miscellaneous forms cannot easily be defined. Many of the forms named by certain authors are given other names by other authors. Even the sentence completion treated in this book is called *simple recall* by other writers. Many miscellaneous forms here treated will be simply combinations of forms already presented, or those forms in a different mechanical organization. Many of these forms are original.

I. Rules for Constructing Miscellaneous Forms

No definite rules other than those given for other forms are necessary. The whole matter of building reliable tests rests upon a consideration of saving time, stating items clearly, and making the directions so simple that the dullest pupil in the group tested can understand directions. All rules of good mechanical form and grammatical structure apply to all miscellaneous forms.

1. Rules for keys of answers. In general, keys of answers should fit mechanically the printed or mimeographed page of the test so that the answers of students are in line with the answers on the key of answers. Anyone acquainted with rules given under other forms should have no difficulty in constructing rapid and accurate scoring keys.

2. Use of these forms for other subjects. By carefully studying these types in the several subjects illustrated, teachers of other subjects can adapt them without trouble. Diagrams, maps, and graphs may be adapted to many subjects. In such forms, number or letter the diagrams and use recall or matching types of response. The performance test in woodworking, test 8.3, is a sample of a form which may be used in many subjects involving construction.

3. Scoring. Most of the miscellaneous forms are scored by counting the number of correct responses. The scoring rules of the preceding chapters may be followed. Scoring the

143

rearrangement, chronological order, or continuity tests requires special consideration, because responses can vary in degrees of approximation to the correct order; that is, one order can be further from the correct order than another. Samples of such forms are: in English, 4.13 on page 165; in home economics, 6.3 on page 169, 6.4 on page 169, and 6.5 on page 170; and in science, 11.5 on page 206. A number of methods for scoring these tests has been proposed. The simplest is to set a maximum score and then subtract the sum of the differences between the students' scores and the key of answers from this maximum score. The maximum score will vary with the number of items and will also depend upon whether the number of items is odd or even. For an even number of items, let

$$\text{Maximum Score} = \frac{n^2}{2};$$

and for an odd number of items, let

$$\text{Maximum Score} = \frac{n^2 - 1}{2},$$

where n is number of items to be arranged in order. The pupil's score, then, would be the difference between the maximum score and the sum of the differences between his answers and the key of answers.

An illustration from the tests having even numbers of items (such as the English test, 4.13 on page 165) will make this clear. If the number of items is 4, the maximum score is 8 $\left(\frac{n^2}{2} = \frac{4^2}{2} = \frac{16}{2} = 8\right)$. Suppose that the key of answers, three students' answers, and the difference between each student's answer and the key of answers are:

Item	Key of Answers	Answers of Student A	Difference Between Key and A's Answers	Answers of Student B	Difference Between Key and B's Answers	Answers of Student C	Difference Between Key and C's Answers
a	4	4	0	1	3	2	2
b	3	3	0	2	1	4	1
c	2	2	0	3	1	1	1
d	1	1	0	4	3	3	2
			$\Sigma D = 0$		$\Sigma D = 8$		$\Sigma D = 6$

Student A gave the same order as the key; therefore, the sum of the differences between his order and the key is zero. His score is $8 - 0$, or 8. Student B has placed the items in the poorest possible order. The sum of differences between his order and the key is 8. His score is $8 - 8$, or 0. Student C has missed the items badly, but not so badly as Student B. The sum of the differences between his order and the key is 6. Therefore, his score is $8 - 6$, or 2.

The sum of the maximum differences for any number of items from 3 to 10 is:

Number of Items	Sum of Differences
3	4
4	8
5	12
6	18
7	24
8	32
9	40
10	50

In the *continuity* form, it is advisable to have the same number of items within each group, so that the same maximum score may be used for each group. Too many items within a group make the test time-consuming and lower its reliability. The maximum number of items to be arranged should seldom exceed ten.

Scoring methods for a number of tests are given. The scoring of the performance test in woodwork, test 8.3, is complicated and is given in detail. In maps and diagrams, do not require pupils to locate positions, as scoring is seldom objective unless a measuring device similar to the woodworking performance test is used.

II. Samples in Elementary and High School Subjects

Samples in every subject will not be given. Some forms already shown may also be classified under miscellaneous forms and will be referred to by subject and number. Samples in some high school subjects are adaptable to elementary school subjects.

1. Arithmetic. The illustration given in Chapter II, test 1, page 23, as a special form, is really an arrangement of multiple

choice and computation, and could be classified as a miscellaneous form.

1.1 Errors in arithmetical problems.

Directions. Below you will find some arithmetic examples in which mistakes have been made, and a list of reasons for these mistakes. Work each example and draw a circle around the figure or figures that are incorrect. In the parentheses to the left of each example, write the number of the reason for the mistake. Notice the sample, A, which is correct.

Examples	*Reasons*
.1. (2) 248	1. Did not carry.
− 87	2. Did not follow direction
(335)	of the sign telling what
	to do.
	3. Combination inaccurate.

	Answer Key
	The underscored numbers should be circled.
1. ( ) 8	1. (1) 27
24	
+ 5	
27	
2. ( ) 14	2. (3) 88
× 6	
88	
3. ( ) 489	3. (2) 165
+324	
165	
4. ( ) 645	4. (1) 828
+283	
828	
5. ( ) 18 ÷ 6 = 12	5. (2) 12

Rules for scoring. Score one point for each correct response. Do not give credit for partial answer. The maximum score is 10 points.

1.2 Primary counting.

Directions (*To be read to the children*). Here are some bunnies. They are trying to make a sentence, but they are asking you to add

the number of bunnies in a sentence and write the number which will be correct.

Let us look at the first line, which is marked *Sample A*. How many bunnies are in this line? (*Teacher waits for answer.*) Yes, there are two bunnies; so the way to complete the sentence is to say, "One bunny and one bunny are two," and write the number 2 on the line. Now take each line and find out how many bunnies are on each line and write the number at the end of the line.

						KEY
Sample A.		and		are (*2*)		
1.		and		are ( )		3
2.		and		are ( )		4
3.		and		are ( )		4
4.		and		are ( )		4
5.		and		are ( )		5

2. Art.
2.1 Information about pictures.

Directions. Below are four columns, the second of which contains the date during which the artist may or may not have lived. The fourth column contains the titles of eleven numbered pictures. In the first column of parentheses, write the names of eight American artists so that the first letters of the surnames will be in order to spell "American." In the second column, if the artist did not live during the stated time which lies parallel to his name, draw a line through the date. If the artist did live during the stated time, leave it alone.

In the third column parallel to the name of each artist place the number of the picture, listed in the last column, which he painted.

Artist	Date	Number of Artist's Picture	Titles of Pictures
1. (_____)	19–20th C.	( )	1. *Agnew Clinic*
2. (_____)	18th C.	( )	2. *Blacksmith*
3. (_____)	18–19th C.	( )	3. *Charitas*
4. (_____)	19–20th C.	( )	4. *Diana's Hunt*
5. (_____)	18–19th C.	( )	5. *Harp of the Winds*
6. (_____)	18–19th C.	( )	6. *Herself*
7. (_____)	19–20th C.	( )	7. *Home of the Heron*
8. (_____)	18–19th C.	( )	8. *King Lear*
			9. *Lady Wentworth*
			10. *La Argentina*
			11. *Portrait of Whitman*

2.2 Information about pictures and painters.

Directions to teacher. Flash each picture exactly two minutes to give the pupils ample time to clearly identify the picture in their minds before writing the answer.

Directions to pupils. A number of pictures or works of art will be shown for two minutes each. You are to write: (*a*) the name, (*b*) the exact date, (*c*) the place where the artist lived, and (*d*) the title of the picture or the work of art in the space provided below. The first picture is *Miss Alexander*, and the information is given as a sample.

A. (*John A. M. Whistler*) *a.* artist
(*1888 A. D.*) *b.* date
(*America*) *c.* place
(*Miss Alexander*) *d.* picture

1. (_____) *a.* artist
(_____) *b.* date
(_____) *c.* place
(_____) *d.* picture

KEY

1*a.* Giotto
b. 1305 A. D.
c. Italy
d. *Joachim Returning to His Sheepfold.*

KEY

2. (_____)   *a.* artist   2*a.* Leonardo da Vinci
  (_____)   *b.* date   *b.* 1503–06 A. D.
  (_____)   *c.* place   *c.* Italy
  (_____)   *d.* picture   *d.* *Mona Lisa*

3. (_____)   *a.* artist   3*a.* Saint-Gaudens
  (_____)   *b.* date   *b.* 1887 A. D.
  (_____)   *c.* place   *c.* Chicago
  (_____)   *d.* picture   *d.* *Lincoln*

4. (_____)   *a.* artist   4*a.* Rodin
  (_____)   *b.* date   *b.* 1904 A. D.
  (_____)   *c.* place   *c.* France
  (_____)   *d.* picture   *d.* *The Thinker*

Rule for scoring. Score each correct answer one point. The maximum score of this test is 16 points. Do not count spelling.
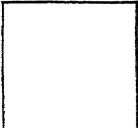
2.3 Art appreciation.
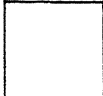
Directions. You will be given several plates—pictures done by famous artists. Study the line arrangement in each composition. Select the dominant line, making sure that it is given its full length and full value in every way. Select another line which is subordinate and yet repeats the same direction. Draw, in the squares below, the skeleton or analysis of the composition.

A. *Pinkie* by Lawrence

3. *Sistine Madonna* by Raphael

1. *Lavinia* by Titian

4. *Mona Lisa* by Leonardo Da Vinci

2. *St. Genevieve* by De Chavannes

5. *Miss Alexander* by Whistler

Rules for scoring. Each picture that is approximately analyzed is to be counted one point. Do not count off for overanalysis.

KEY
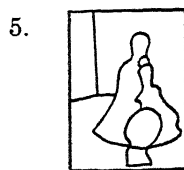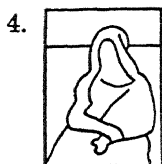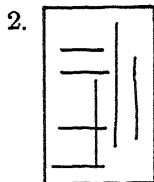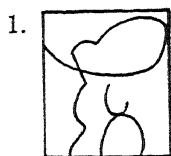
Note to teacher.   Either flash the prints or give a copy of each to each pupil.   If large copies are shown, allow any number of minutes, say two or three, for each picture.   The scoring of this test cannot be highly objective.

2.4 Color wheel.

Directions.   The names of the colors in the column below are the correct names for the sections on the color wheel in the diagram at the right.   Write in the parentheses beside each word (color), the number of the section for which it is the correct color.

KEY			
1. (12)	A. (*1*) yellow	*Color Wheel*
1. (12)	1. ( ) yellow-green	
2. (3)	2. ( ) orange	
3. (6)	3. ( ) red-purple	
4. (2)	4. ( ) yellow-orange	
5. (11)	5. ( ) green	
6. (8)	6. ( ) blue-purple	
7. (5)	7. ( ) red	
8. (10)	8. ( ) blue-green	
9. (9)	9. ( ) blue	
10. (4)	10. ( ) red-orange	
11. (7)	11. ( ) purple	
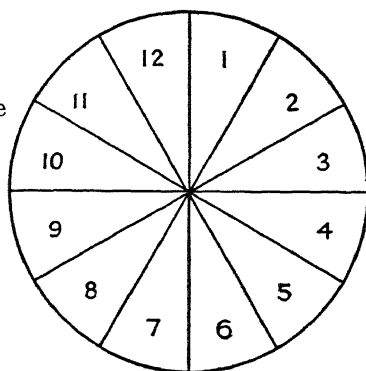
2.5 Information about paintings.

Directions.   Below are listed five titles of paintings.   In the parentheses before each title you are to write the name of the school of the artist.   To the right of the title write the last name of the artist.

	School	*Painting*	*Artist*	
KEY	(*English*)	A. *Shoeing the Mare*	(*Landeer*)	KEY
(English) 1.	(_____)	1. *Miss Bowles*	(_____)	1. (Reynolds)
(French) 2.	(_____)	2. *Feeding Her Birds*	(_____)	2. (Millet)
(English) 3.	(_____)	3. *The Fighting Temeraire*	(_____)	3. (Turner)
(American) 4.	(_____)	4. *The Fog Warning*	(_____)	4. (Homer)
(Florentine) 5.	(_____)	5. *Sistine Ceiling*	(_____)	5. (Michel-angelo)

Rules for scoring. Count each correct response one point. Do not count off for spelling. Maximum score is 10 points.

3. Commercial.

3.1 Bookkeeping entries.

Directions. Below to the right is given a sheet from a journal with numbered places for entries. To the left is a list of the entries. Place the number for the correct position of the entry in the parentheses before the entry.

Entries

A. (*0*) The year of the entries.

1. (   ) The credit amount column.

2. (   ) Debit amount column.

3. (   ) Credit account position.

4. (   ) Debit account position.

5. (   ) Journal explanation.

6. (   ) Ledger folio column.

7. (   ) Date of first entry.

8. (   ) Journal heading.

Journal

3.2 Entries on working sheet.

Directions. Below is given a working sheet. Carry the amounts in the trial balance into the columns necessary for completing the working sheet. The first item (Cash) is an example.

Name of Account	Trial Balance		Profit and Loss		Surplus		Balance Sheet	
Cash	18,325.						18,325.	
Inventory, 1-1-30	37,025.							
Surplus, 1-1-30		25,350.						
Capital stock		35,000.						
Dividends paid	5,000.							
Inventory, 12-31-30	60,350.	60,350.						
$10,100.								

KEY

Name of Account	Trial Balance		Profit and Loss		Surplus		Balance Sheet	
Cash	18,325.						18,325.	
Inventory, 1-1-30	37,025.		37,025.					
Surplus, 1-1-30		25,350.				25,350.		
Capital stock		35,000.						35,000.
Dividends paid	5,000.				5,000.			
Inventory, 12-31-30	60,350.	60,350.						
$10,100.				10,100.			10,100.	
Net Loss—to Surplus				26,925.	26,925.			
			37,025.	37,025.				
Deficit, 12-31-30						6,575.	6,575.	
					31,925.	31,925.	35,000.	35,000.

Rules for scoring. Count each correct response one point. There are 12 correct responses. The key shows all original items and lines for properly lining up with the test.

3.3 Working sheet.

Directions. In the working sheet below, make an (X) to indicate in which columns the respective accounts will appear.

WORKING SHEET[1]

Name of Account	Trial Bal.		Adjusts.		Balance Sheet		Profit and Loss Statement	
	Dr.	Cr.	Dr.	Cr.	Asset	Liab.	Cost Exp.	In-come
1. Cash								
2. Notes Rec.								
3. Accts. Rec.								
4. Mdse. Inv.								
5. Store and Off. Sup-plies								
6. Prep. Ins.								
7. Equip.								
8. Depr. Res.								
9. Notes Pay.								
10. Accts. Pay.								
11. Capital								
12. Drawing								
13. Sales								
14. Purchases								
15. Rent Exp.								
16. Salary Exp.								
17. S. & O. Sup. Used								
18. Expired Ins.								
19. Depr. Exp.								

[1] Bow, Bernice, *Improved Methods of Teaching Commercial Subjects*, master's thesis, University of Oklahoma, 1934. Used by permission of the author.

3.4 Journal entries for transactions.

Directions. Make the journal entries for the transactions given below, indicating whether each is a debit or a credit, as shown in the sample, A.

A. Give the entry for discounting an interest-bearing note, if the proceeds are less than the face.	(*dr. Cash*) 1 (*dr. Int. Exp.*) 2 (*cr. Notes Rec. Disc.*) 3
1. Give the entry for acquiring treasury stock at par, if it is reissued at a discount.	(_____) 4 (_____) 5 (_____) 6
2. Give the entry for recording the sale of treasury stock that is acquired at par and sold at a premium.	(_____) 7 (_____) 8 (_____) 9
3. Give the entry for a subscription of stock.	(_____)10 (_____)11
4. Give the entry for recording full payment of stock and issuance of stock.	(_____)12 (_____)13 (_____)14 (_____)15
5. Give the entry for establishing a petty cash fund.	(_____)16 (_____)17
6. Give the entry for recording accrued wages.	(_____)18 (_____)19
7. Give the entry for recording accrued interest on notes payable.	(_____)20 (_____)21

Rule for scoring. The score is the number correct. Do not count spelling.

3.5 Classification of transactions.

Directions. Read each transaction below, then select from the list of accounts given the account to be debited and the account to be credited in making the journal entry. Write the numbers of the accounts in the appropriate column.

Accounts

1. Cash	6. Notes Payable
2. Creditor	7. Notes Receivable
3. Customer	8. Proprietor's Capital
4. Expense	9. Proprietor's Drawing
5. Merchandise Inventory	10. Purchases
	11. Sales

Transactions	Debit	Credit	
A. John Jones invested cash in the business.	1	8	A
1. Paid the store rent for the month.			1
2. Sold merchandise on account.			2
3. Bought merchandise on account.			3
4. Received a note from a customer in full of balance.			4
5. Gave a creditor our note in full of account.			5
6. Returned merchandise to a creditor for credit.			6
7. Gave a customer credit for merchandise which he returned.			7
8. The proprietor took cash for personal use.			8
9. Gave customer a cash refund for merchandise returned.			9

Rule for scoring. The score is the number of correct blanks; 18 points is the maximum score.

3.6 Business forms.

Directions. Below are given two legal forms illustrative of the processes by which the parties are brought into court. Several parts in each form are left blank. Place in the parentheses to the left the number of the correct word given in the right-hand column. The sample, *A*, is correct.

	A. (5)..... Form I	1. attorney for
	Filed December 1, 1907	plaintiff
	State of Illinois ⎫ _ss._	2. defendant
	Cook County ⎰	3. deputy
	Superior Court of Cook County	4. plaintiff
KEY	January Term, A. D., 1908	5. praecipe
4	1. ( )..Thomas Anderson,	6. return of sheriff
2	2. ( )..Joseph T. Rogers,	7. seal
	The clerk of the said court	8. sheriff
	will issue a summons in the	9. witness
	above-entitled cause to said	10. writ of sum-
	defendant in a plea of tres-	mons
	pass on the case upon prom-	
	ises to pay the damages	
	to the said plaintiff.	
1	3. ( )..........John Wilson,	

6	4. ( )....... Form II
	December, A. D., 1907
	Served this writ within
	County of Cook, State
	of Illinois, on the within-
	named defendant by de-
	livering a copy thereof to
	him this seventh day of
	January, 1908.
	Fees, $1.00
8	5. ( )........Jack Brown,
3	6. ( )........Jim Johnson,

Rule for scoring.   Score each correct response one point.

3.7 Bookkeeping.

Directions.   Indicate by a check mark in the columns headed
"Dr." and "Cr." whether the balance of the following accounts taken
from the ledger of John Doe Co. would appear as debits or credits.
In the column headed "Classification," record the number of the
correct classification of the given item.   The sample, *A*, is correctly
done.

Classification of Items

1. Asset
2. Deduction from Asset
3. Deduction from Expense
4. Deduction from Income
5. Expense
6. Income
7. Liability
8. Proprietorship (Proprietary Interest)

Accounts	*Dr.*	*Cr.*	*Class.*
A. Delivery Equipment	(✓)	( )	(5)
1. Cash	( )	( )	( )
2. Notes Receivable	( )	( )	( )
3. Accrued Interest on Notes Receivable	( )	( )	( )
4. Reserve for Doubtful Accounts (Bad Debts)	( )	( )	( )
5. Materials Inventory	( )	( )	( )
6. Accrued Taxes	( )	( )	( )
7. Office Equipment	( )	( )	( )
8. Capital Stock	( )	( )	( )
9. Lumber Sales	( )	( )	( )

4. English.

4.1 Literature—Illustration of a combination of recall and matching.

Directions. Listed below are 22 titles of literary productions. In the parenthesis before each production, you are to write the abbreviation for the kind of each production, using the following abbreviations:

(1) Oration, "O"
(2) Poetry, "P"
(3) Theological Essay, "TE"
(4) General Essay, "GE"
(5) Political Essay, "PE"

(6) Patriotic Hymn, "PH"
(7) History, "H"
(8) Novel, "N"
(9) Short Story, "SS"

To the right of each title is a parenthesis in which you are to write the last name of the author of each production.

Kind of Production	*Title*	*Author*
( )	*Story of a Bad Boy*	(_____) 1
( )	*Reply to Hayne*	(_____) 2
( )	*Two Years Before the Mast*	(_____) 3
( )	*Man Without a Country*	(_____) 4
( )	*Little Women*	(_____) 5

Kind of Production	*Title*	*Author*	
( )	*Conquest of Mexico*	(_____)	6
( )	*Uncle Tom's Cabin*	(_____)	7
( )	*Evangeline*	(_____)	8
( )	*America*	(_____)	9
	etc.		

4.2 Knowledge of parts of speech.

Directions. In each sentence there is a part of speech that is the same as the one underscored. Write in parenthesis at the right of the page the other word or words which are the same part of speech as the one underscored. The sample is correct. The score will be the number of correct answers.

(*Example*) Noun	A. The <u>book</u> was placed on the desk.	(*desk*)
Noun	1. <u>Mary</u> has gone to Chicago.	(_____)
Verb	2. She <u>studied</u> and then went to the movies.	(_____)
Pronoun	3. <u>He</u> came early, but she waited until later.	(_____)
Adjective	4. May visited the <u>beautiful</u> art gallery, where she saw a valuble picture.	(_____)
Adverb	5. The plane was piloted <u>carefully</u>, but the passengers were injured seriously.	(_____)
Preposition	6. I shall go <u>in</u> my car; you can go on the train.	(_____)
Conjunction	7. Jim <u>and</u> John have studied, but June has not.	(_____)
Interjection	8. <u>Oh!</u> how I dread the test but, alas! it will soon be over.	(_____)

4.3 Parts of speech in use.

Directions. Below are a number of sentences with one word underscored in each sentence. To the right are two columns calling for the part of speech and the use of each underscored word. Complete the blanks. The sample, *A,* is correctly done.

	Part of Speech		Use	
A. Apples ripen in autumn.	(noun)A	(subject)A
1. The men built a cabin.	(_____) 1	(_____) 1
2. The letter is for him.	(_____) 2	(_____) 2
3. Tom is our president.	(_____) 3	(_____) 3
4. Jack sent me some fruit.	(_____) 4	(_____) 4
5. Snow falls in winter.	(_____) 5	(_____) 5

KEY

Part of Speech   Use
1. noun   1. direct object
2. pronoun   2. object of preposition
3. noun   3. predicate nominative

4. pronoun   4. indirect object
5. verb   5. predicate

Rule for scoring. Count each correct response one point. Make no deduction for spelling. The total score for this test is 10 points.

4.4 Pronouns.

Directions. In the sentences below, underscore any pronoun that is not correct, and write the correct form in the parentheses to the right. Some of the sentences may be correct; there will not be more than one mistake in each sentence.

A. Whom is the woman going down the street? (who)A
1. John went to visit his aunt, whom he had not seen for a long time. (_____) 1
2. Who would you choose if you were I? (_____) 2
3. My brother will take her and I, or he will not go. (_____) 3
4. Annie said that she would take we girls too. (_____) 4
5. Martha, who you see in the garden, will have charge of the meeting. (_____) 5

Rules for scoring. Count each word correctly underscored one point. Count each correctly recalled word one point.

4.5 Clauses and phrases.

Directions. For each underscored word or phrase in the first column, there is an item in the second column that matches it. Find the name of this item and place its number in front of the sentence in the first column.

1. (   ) If he went with <u>you</u>, I will not go.
2. (   ) <u>Where he went</u> was not known to his wife.
3. (   ) The one <u>who cannot speak</u> will be unnoticed.
4. (   ) John, <u>Mrs. Finley's grandson</u>, will not march in the parade.
5. (   ) I came from a place <u>where the sand blows most of the time.</u>

1. adjective clause
2. adjective phrase
3. adverbial phrase
4. appositive
5. infinitive clause
6. noun clause
7. prepositional phrase (adverbially used)
8. prepositional phrase (objectively used)

4.6 Violation of rules in sentences.

Directions. Below is given a group of sentences preceded by a list of rules. In each sentence one rule of grammar has been violated. Find the rule which should correct the mistake in each sentence and place its number in the parentheses in front of the sentence. The sample, *A*, illustrates a correct response.

Rules

1. The period follows an imperative sentence.
2. A noun used as nominative of address should be separated from the rest of the sentence by a comma.
3. The names of particular places, persons, or things always begin with capital letters.
4. The apostrophe is used to show the omission of a letter or letters within a word.
5. The auxiliary verb forms *have, has,* and *had* are used with the past participle of the verb.
6. The plural verb *were* is used with the singular or plural form of the pronoun *you.*
7. A declarative sentence is followed by a period.
8. The comma is used to separate words in a series.

Sentences

A. (*4*) We dont know where he lives.
1. (   ) Where was you this morning?
2. (   ) Please close the door?
3. (   ) John here is a letter for you.

4. (   ) Mary has went to school.
5. (   ) I live in ada, oklahoma.

Rules for scoring. Each correct response is to be counted as one point. The total possible score for this test is five points.

4.7 Redundancies.

Directions. Cross out the words that make the statements below untrue.

(Example) A. Sir Walter Scott's works are remarkable for their descriptive accounts, historical characterizations, and ~~classical forms~~.

" Classical forms" is not true of Sir Walter Scott, so it is crossed out.

1. *The Pit and the Pendulum* is a truthful, vivid account of the horrors of the Spanish Inquisition.
2. Frank Stockton is a modern writer who writes entertaining but serious accounts of New England life.
3. In *The Message to Garcia,* Elbert Hubbard extolls the man who succeeds because he is industrious, who is continually questioning his superiors, and whose work is not limited by the whistle.

4.8 Conjugation of verb.

Directions. Opposite the verb form of each verb given are places for telling the person, number, voice, tense, and mood. Place the correct answer in each of the blanks provided.

Verb	Person	Number	Voice	Tense	Mood
(Sample) I am	1st	*Sing.*	*Act.*	*Pres.*	*Ind.*
I will be					
He has decided					
They are going					
If I went					
You have called					

KEY

Verb	Person	Number	Voice	Tense	Mood
I will be	1st	Sing.	Act.	Fut.	Ind.
He has decided	3rd	Sing.	Act.	Pres. Perf.	Ind.
They are going	3rd	Plur.	Act.	Pres.	Ind.
If I went	1st	Sing.	Act.	Past	Subj.
You have called	2nd	Sing.	Act.	Pres. Perf.	Ind.

Rule for scoring. Each blank correctly filled in counts one point.

4.9 Recognition of nouns.

Directions. Below is given a paragraph containing a number of nouns. Place them in the parentheses at the left in the order in which they occur.

KEY		
1. (	waves	)
2. (	foam	)
3. (	boat	)
4. (	turn	)
5. (	larboard	)
6. (	direction	)
7. (	thunderbolt	)
8. (	time	)
9. (	noise	)
10. (	water	)
11. (	shriek	)

(*Sample*)
A. (_____*hour*_____)
1. (_____)
2. (_____)
3. (_____)
4. (_____)
5. (_____)
6. (_____)
7. (_____)
8. (_____)
9. (_____)
10. (_____)
11. (_____)

It could not have been more than an hour afterward until we suddenly felt the waves subside, and were enveloped in foam. The boat made a sharp turn to larboard, and then shot off in its new direction like a thunderbolt. At the same time the roaring noise of the water was completely drowned by a kind of shrill shriek.

Rule for scoring. Score each correct response one point.

4.10 Parts of speech of homonyms.

Directions. Below are sentences in which there are words having the same sound but different meanings. Usually, though not always, they also differ in spelling. Underscore these homonyms and in the

blanks to the right tell the part of speech of each, in the *order* that they occur in the sentence.

A. It is only <u>fair</u> to (*adj.*   )A 1
boost the <u>fair</u>, and (*noun*   )A 2
those who do <u>fare</u> (*verb*   )A 3
better.   (A1),
(A2), and (A3).

	KEY	
1. Mary, you go and get the little ewe from under the yew tree. (1), (2), and (3).	(_____) 1 (_____) 2 (_____) 3	(pronoun) 1 (noun) 2 (adj.) 3
2. Will you mete out the ground meat and meet me at Brown's in ten minutes? (4), (5), and (6).	(_____) 4 (_____) 5 (_____) 6	(verb) 4 (noun) 5 (verb) 6
3. Thomas and Gore, our two Oklahoma Senators, showed us a good time, too, when we went to Washington. (7), (8), and (9).	(_____) 7 (_____) 8 (_____) 9	(adj.) 7 (adv.) 8 (prep.) 9
4. He found this peculiar root system when he took the Eastern Route. (10) and (11).	(_____) 10 (_____) 11	(adj.)10 (noun)11
5. Please write the right directions for the initiation rite. (12), (13), and (14).	(_____) 12 (_____) 13 (_____) 14	(verb)12 (adj.)13 (noun)14
6. The boy rowed the boat to the island road, where he rode horseback to Rhode Island. (15), (16), (17), and (18).	(_____) 15 (_____) 16 (_____) 17 (_____) 18	(verb)15 (noun)16 (verb)17 (proper noun)18

7. The principal of (_____) 19
   the school had the (_____) 20
   principle of sports-
   manship firmly in
   mind. (19) and
   (20).

KEY		
(	noun	)19
(	noun	)20

Rules for scoring. The maximum possible score is 20 points. Count each correct response one point.

4.11 Diagramming.

Directions. Below is given a sentence and the diagram of the sentence, with the words omitted and numbers in their places. Choose the word or words of the sentence which belong in the place of the number in the diagram, and write the word or words in the correspondingly numbered parentheses to the right. The sample, *A*, is correctly done.

Sentence: An interesting old lady was selling apples in front of the department store.

Diagram	*Answers*

A. (*lady*)
1. (_____)
2. (_____)
3. (_____)
4. (_____)
5. (_____)
6. (_____)
7. (_____)
8. (_____)
9. (_____)

KEY		
(was selling	)	1
(apples	)	2
(an	)	3
(interesting	)	4
(old	)	5
(in front of	)	6
(store	)	7
(the	)	8
(department	)	9

Rules for scoring. Count each correct answer one point. Where there is a vertical bar in the answer key, each answer is correct for any one of the numbers. Do not count off for spelling.

4.12 Pronunciation.

Directions. Below is given a list of ten words. In the parentheses to the left of the word you are to state what part of speech it is; in the parentheses to the right of the word you are to give its diacritical markings.

				KEY
(Sample) A. (noun)	dictionary	(dic' tion ă rĭ)	
1. (_____)	incognito	(_____)	(in cŏg' nĭ tō)
2. (_____)	dew	(_____)	(dū)
3. (_____)	epitome	(_____)	(ĕ pĭt' ŏ mē)
4. (_____)	automobile	(_____)	(ô tŏ mō' bĭl)
5. (_____)	stationary	(_____)	(sta' tion ă rĭ)
6. (_____)	stationery	(_____)	(sta' tion ĕr ĭ)
7. (_____)	secretary	(_____)	(sĕk' re ta rĭ)
8. (_____)	contumely	(_____)	(kŏn' tū mē lĭ)
9. (_____)	amenable	(_____)	(a mē' na b l)
10. (_____)	Buenos Aires	(_____)	(Bwā' nōs Ī' rĕs)

The marks in this key follow the *Webster's Collegiate Dictionary*. Any standard dictionary should count.

Rule for scoring. Each blank correctly filled in will be counted one point.

4.13 Rearrangement or chronological order.

Directions. Rearrange these events in the order in which they appear in the story.

(*Example*) A. (*3*) Jessica runs away with Lorenzo.
            (*1*) Antonio borrows money of Shylock.
            (*4*) Bassanio and Portia are married.
            (*2*) The Prince of Arrazon selects a chest.

1. ( ) Grettir kills the bear.
  ( ) Thorfinn leaves for a Yule visit.
  ( ) Grettir meets Angle.
  ( ) Grettir kills the berserks.
2. ( ) Odysseus is struck by Antinoüs.
  ( ) The wooers are overthrown.
  ( ) Odysseus passes between Scylla and Charybdis.
  ( ) He lives on Circe's island.

Note. The scoring of this form requires a special formula. See page 144.

4.14 Classification of writers, master list form.

Directions. In the first column are listed a number of writers and in the second column are listed the classifications of those men. In the parentheses to the left of each man's name you are to place

the number or numbers of his correct classification. Some writers have only one classification, while others have two. In case a writer has only one classification, make a cross in the second parentheses.

	Writers		Classifications
1. ( ) ( )	Edgar Allan Poe		1. Dramatist
2. ( ) ( )	Thomas Nelson Page		2. Historical writer
3. ( ) ( )	John Burroughs		3. Humorist
4. ( ) ( )	Henry Van Dyke		4. Naturalist
5. ( ) ( )	William Dean Howells		5. Novelist
6. ( ) ( )	Theodore Roosevelt		6. Orator
7. ( ) ( )	Kate Douglas Wiggin		7. Poet
8. ( ) ( )	Bret Harte		8. Political essayist
9. ( ) ( )	Woodrow Wilson		9. Short story writer
10. ( ) ( )	James Whitcomb Riley		10. Song writer
11. ( ) ( )	Jack London		
12. ( ) ( )	Ella Wheeler Wilcox		
13. ( ) ( )	Eugene Field		
14. ( ) ( )	Booth Tarkington		
15. ( ) ( )	Bronson Howard		
16. ( ) ( )	Bayard Taylor		
17. ( ) ( )	Sidney Lanier		
18. ( ) ( )	Joel Chandler Harris		
19. ( ) ( )	Mark Twain		
20. ( ) ( )	John Bannister Tabb		

4.15 Proofreading in a theme.

Directions. In the following are errors in punctuation, capitalization, spelling, and grammar. Underscore the error and write the correction in the space to the right of each line. There is never more than one error per line. If there is no error in a line, write *C* in the correction column opposite this line.

Corrections

Dan, the dog I love so well
was sick. He, two, was growing old.
On the first day he came to me crying I
thought he was only cold. I soon found
that he was sickly. The sight of his
pleading eyes drew a deep sympathy from
my heart but it did not furnish me with
a clew of his ailment.

Rules for scoring. Each correction or recognition of a correct line counts one point. Each error should be subtracted from the number of correct points.

4.16 Proofreading in check list form.

Directions. Mark with a cross (X) each sentence containing an error in grammar. Mark *C* every sentence that is correct.

1. (　) Set the book down.
2. (　) He is going to set down.
3. (　) I am going to lay down.
4. (　) He seen him yesterday.
5. (　) She gave it to we girls.
6. (　) For whom is it?
7. (　) Anyone can secure his ticket.

5. Latin.
5.1 Incorrect grammatical structure in Latin.

Directions. Below is a number of Latin sentences. One word in each sentence is grammatically incorrect. Write the correct form of the word in the blank to the right.

1. Milites castra munivit.　　　(＿＿＿＿＿＿＿＿＿) 1
2. Aquam puero parva dabo.　　(＿＿＿＿＿＿＿＿＿) 2
3. Agricola frumentum equis dabunt.(＿＿＿＿＿＿＿＿＿) 3
4. Caesar bella multas pugnavit.　(＿＿＿＿＿＿＿＿＿) 4
5. Aquam bonum amo.　　　　(＿＿＿＿＿＿＿＿＿) 5

5.2 Construction or grammatical form in sentences.

Directions. Below is a paragraph with certain words and phrases underscored. In Column I give the construction or grammatical form; in Column II give the reason for such form.

Hōc proeliō factō et prope ad interneciōnem gente ac nōmine Nerviōrum redāctō, maiorēs nātū, quōs ūnā cum puerīs mulieribusque in aestuāriā ac palūdēs coniectōs dixerāmus, hāc pugnā nūntiātā, cum victōribus nihil impeditum, victīs nihil tutum arbitrārentur, omnium qui supererant consēnsū legātōs ad Caesarem misērunt sēque eī dedidērunt; et in commemorandā civitātis calamitāte, ex sexcentīs ad tres senatōrēs, ex hominum milibus LX vix ad quigentōs qui arma ferre possent sēsē redactōs esse dixerunt. Quōs Caesar, ut in miserōs

ac supplicēs ūsus misericordiā vidērētur, diligentissime conservāvit suīsque fīnibus atque oppidīs uti iussit et finitimīs imperāvit ut ab iniuriā et maleficiō sē suōsque prohibērent.

		Column I		Column II	
A. Hōc proeliō factō	(	*ablative*	) A	(*absolute*	) A
1. cum puerīs	(_____		) 1	(_____	) 1
2. in aestuāriā	(_____		) 2	(_____	) 2
3. victīs	(_____		) 3	(_____	) 3
4. eī	(_____		) 4	(_____	) 4
5. commemorandā	(_____		) 5	(_____	) 5
6. sēsē	(_____		) 6	(_____	) 6
7. ut	(_____		) 7	(_____	) 7
8. fīnibus	(_____		) 8	(_____	) 8
9. finitimīs	(_____		) 9	(_____	) 9
10. maleficiō	(_____		)10	(_____	)10

Rules for scoring.   Score one point for each blank correctly answered.   Do not count misspelled words wrong.   The maximum score is 20 points.

6. Home economics.
6.1 Meat cuts of beef.

Directions.   Below is a drawing showing how breed animals are cut.   In the left-hand column will appear the names of the cuts. Choose the correspondingly numbered part on the drawing and place the number in the space provided before the correct name in the left-hand column.

Wholesale Cuts of Beef Carcass

1. (   ) Round
2. (   ) Loin
3. (   ) Chuck
4. (   ) Flank
5. (   ) Rib
6. (   ) Plate
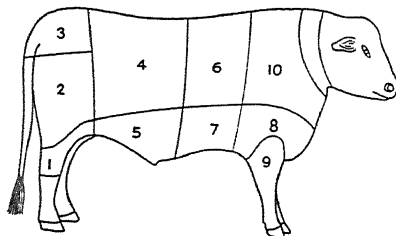
6.2 Table setting.

Directions.   Below is space for a cover for the following menu: cream of lima bean soup, Spanish omelet, hot rolls, fruit cake, hot tea. Place the names of the articles that should be in the positions of the numbers when a person is seated for an informal meal.
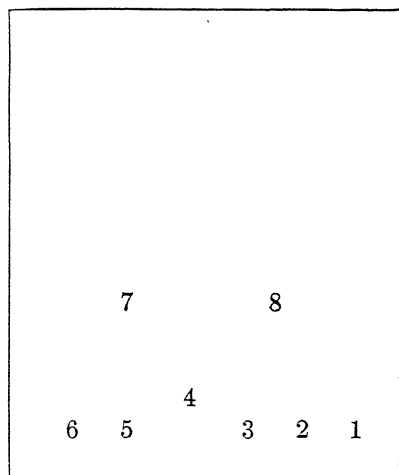
		KEY
1. (————)	1. (tea cup)	
2. (————)	2. (soup sp.)	
3. (————)	3. (knife)	
4. (————)	4. (soup)	
5. (————)	5. (dinner fork)	
6. (————)	6. (napkin)	
7. (————)	7. (bread & butter)	
8. (————)	8. (water glass)	

6.3 Steps in making a dress.

Directions. The following are the steps in making a dress. Arrange the steps in the order in which they should be performed by placing in the blanks *1* for the first, *2* for the second, and so on.

1. ( ) Press material and pattern.
2. ( ) Baste dress together.
3. ( ) Fit dress.
4. ( ) Cut out dress.
5. ( ) Study pattern and fit to person.
6. ( ) Select material and pattern.
7. ( ) Sew on fasteners.
8. ( ) Do machine stitching.

Rules for scoring. The maximum score is **32.** Use the special scoring device mentioned on page 144.

6.4 Steps in making butter cake.

Directions. Below are the steps in making a butter cake. Arrange them in the proper order.

1. ( ) Add flavoring. Blend thoroughly.
2. ( ) Sift flour once, measure, combine with other dry ingredients, and sift three times.
3. ( ) Beat egg whites until stiff but not dry. Fold into the cake batter.

4. (   ) Cream shortening until light and fluffy.
5. (   ) Add a small amount of the dry ingredients to the creamed mixture. Mix thoroughly.
6. (   ) Add sifted sugar, a small amount at a time, and cream the mixture until light, plastic, and smooth.
7. (   ) Add alternately the dry ingredients and the liquids to the creamed mixture and blend well.
8. (   ) Beat egg yolks until thick and lemon-colored, and add the creamed mixture. Beat mixture thoroughly.

Rules for scoring. The maximum score is 32. Use the special scoring device mentioned on page 144.

6.5 *Steps in cooking.*

Directions. Rearrange the following directions for cooking in the order in which they should appear by placing the correct numeral in the parentheses at the left.

A. In making junket:
    (*1*) heat milk until lukewarm
    (*3*) add junket tablet dissolved in cold water
    (*2*) add sugar and flavoring
    (*4*) pour into sherbet glasses

KEY	
	1. To make a plain white sauce:
(2)	( ) add flour and combine well
(3)	( ) add milk and cook
(4)	( ) add seasoning
(1)	( ) melt butter
	2. To make cream soup:
(2)	( ) add salt and pepper to vegetables
(4)	( ) add vegetables to white sauce
(3)	( ) add soda to vegetables if acid
(1)	( ) cook vegetables until tender
	3. To make plain white cake:
(2)	( ) add beaten egg yolk
(1)	( ) add sugar to creamed butter
(3)	( ) add alternately flour and milk and flavoring
(4)	( ) fold in beaten egg whites
	4. To make salad dressing:
(2)	( ) add egg yolks slowly with vinegar
(1)	( ) cream sugar and butter
(4)	( ) add whipped cream
(3)	( ) cook in double boiler

KEY	5. To make pie crust:
(2)	( ) add salt
(3)	( ) add cold water
(4)	( ) roll on board
(1)	( ) cut fat in with flour

Rules for scoring. The maximum score for each group is 8. Use the special scoring device mentioned on page 144.

7. Mathematics.
7.1 Algebra—Value of unknowns.

Directions. Find the values for the unknowns in the following equations. Place the factors in the column marked "Factors" and the final answers in the column marked "Values."

Equations	Factors	Values
1. $7r^2 + 4r - 11 = 0$	(_____)(_____)	(_____)
2. $6s^2 - 7s - 5 = 0$	(_____)(_____)	(_____)
3. $12s^2 + 5s - 3 = 0$	(_____)(_____)	(_____)
4. $2x^2 + x - 15 = 0$	(_____)(_____)	(_____)
5. $9r^2 - 6r - 8 = 0$	(_____)(_____)	(_____)

FACTOR KEY		VALUE KEY	
$(7r + 11)$	$(r - 1)$	$(r = -\frac{11}{7},$	$r = 1)$
$(3s - 5)$	$(2s + 1)$	$(s = \frac{5}{3},$	$s = -\frac{1}{2})$
$(3s - 1)$	$(4s + 3)$	$(s = \frac{1}{3},$	$s = -\frac{3}{4})$
$(2x - 5)$	$(x + 3)$	$(x = \frac{5}{2},$	$x = -3)$
$(3r - 4)$	$(3r + 2)$	$(r = \frac{4}{3},$	$r = -\frac{2}{3})$

Rules for scoring. Score one point for each correct factor and one point for each correct value, which gives a total of four points for each correctly solved problem. Answers must have correct signs to be considered correct.

7.2 Algebra—Problem solving.[2]

Directions. In each of the following problems, the pupil should show all of his work. Do your work carefully. See that your work is neatly done.

1. Add:
$$15a^3 - 9a^2 - 3a - 2$$
$$- 7a^3 - 5a^2 + 13a - 6$$
$$- 8a^3 - 7a^2 + 4a + 8$$
$$3a^3 + 16a^2 - 10a - 2$$

2. Add:
$$12a^3 - 5a^2x + 4ax^2 - x^3$$
$$- 3a^3 - 2a^2x - 13ax^2 + 18x^3$$
$$-17a^3 + 15a^2x + 3ax^2 + 11x^3$$
$$9a^3 - 8a^2x + 6ax^2 - 7x^3$$

3. Subtract:
$$x^5 + 3x^4y - x^3y^2 + 5x^2y^3 - 4xy^4$$
$$+ x^4y - 7x^3y^2 - 6x^2y^3 + 11xy^4 - y^5$$

4. Subtract:
$$5n^3 - 14n^2 + 16n - 9$$
$$-20n^3 + 7n^2 + 13n - 5$$

5. Remove parentheses and combine terms:
$$9m - (4m + 6n) + (3m - n)$$

6. Remove parentheses and combine like terms:
$$8r + (5r - [2s + t])$$

7. Solve:
$$11m + 6 = -9m + 18$$

8. Solve:
$$9m - 7 = 3m - 37$$

9. Solve:
$$10r - (3r + 2) = 9r - (5r - 4)$$

10. Multiply:
$$a - b + c$$
$$a - b + c$$

11. Multiply:
$$m^4 - 3m^3 + 9m^2 - 27m + 81$$
$$m + 3$$

12. Divide:
$$-63x^{10} - 18x^7 + 45x^6 - 99x^4 \div -9x^4 =$$

13. Divide:
$$-12x^4y + 6x^3y^2 - 16x^2y^2 + 20xy^4 \div -2xy =$$

14. The age of John is twice that of his brother James. What are their ages if equal results are obtained by subtracting 5 years from John's age, and adding 10 to James's age? (Form equation and solve.)

[2] Garrison, J. Don, *Objectifying the Scoring of Problem Tests in Elementary Algebra*, master's thesis, University of Oklahoma, 1936. Used by permission of the author.

The problems are reproduced to show the answers in exact positions as calculated by students. A key of answers made directly on the test facilitates scoring.

1. Add:

$$15a^3 - 9a^2 - 3a - 2$$
$$-7a^3 - 5a^2 + 13a - 6$$
$$-8a^3 - 7a^2 + 4a + 8$$
$$3a^3 + 16a^2 - 10a - 2$$

$\boxed{3a^3}$ $\boxed{- 5a^2}$ $\boxed{+ 4a}$ $\boxed{- 2}$

2. Add:

$$12a^3 - 5a^2x + 4ax^2 - x^3$$
$$- 3a^3 - 2a^2x - 13ax^2 + 18x^3$$
$$-17a^3 + 15a^2x + 3ax^2 + 11x^3$$
$$9a^3 - 8a^2x + 6ax^2 - 7x^3$$

$\boxed{a^3}$ $\boxed{}$ $\boxed{}$ $\boxed{+ 21x^3}$

3. Subtract:

$$x^5 + 3x^4y - x^3y^2 + 5x^2y^3 - 4xy^4$$
$$+ x^4y - 7x^3y^2 - 6x^2y^3 + 11xy^4 - y^5$$

$\boxed{x^5}$ $\boxed{- 2x^4y}$ $\boxed{- 6x^3y^2}$ $\boxed{- 11x^2y^3}$ $\boxed{- 15xy^4}$ $\boxed{- y^5}$

4. Subtract:

$$5n^3 - 14n^2 + 16n - 9$$
$$-20n^3 + 7n^2 + 13n - 5$$

$\boxed{25n^3}$ $\boxed{- 21n^2}$ $\boxed{+ 3n}$ $\boxed{- 4}$

5. Remove parentheses and combine terms:

$$9m - (4m + 6n) + (3m - n)$$

$\boxed{9m - 4m - 6n}$ $\boxed{+ 3m - n}$

$\boxed{8m - 7n}$

6. Remove parentheses and combine like terms:

$$8r + (5r - [2s + t])$$

$\boxed{8r + (5r - 2s - t)}$

$\boxed{8r + 5r - 2s - t}$

$\boxed{13r - 2s - t}$

7. Solve:

$$11m + 6 = -9m + 18$$

$\boxed{11m + 9m} = \boxed{18 - 6}$

$\boxed{20m} = \boxed{12}$

$\boxed{m} = \boxed{\tfrac{3}{5}}$

8. Solve:

$$9m - 7 = 3m - 37$$

$\boxed{9m - 3m} = \boxed{- 37 + 7}$

$\boxed{6m} = \boxed{- 30}$, $\boxed{m} = \boxed{- 5}$

9. Solve:

$$10r - (3r + 2) = 9r - (5r - 4)$$

$\boxed{10r - 3r - 2} = \boxed{9r - 5r + 4}$ $\boxed{3r} = \boxed{6}$

$\boxed{7r - 2} = \boxed{4r + 4}$ $\boxed{r} = \boxed{2}$

$\boxed{7r - 4r} = \boxed{4 + 2}$

10. Multiply:

$$a - b + c$$
$$a - b + c$$

$\boxed{a^2}$ $\boxed{- ab}$ $\boxed{+ ac}$

$\boxed{- ab}$ $\boxed{+ b^2}$ $\boxed{- bc}$

$\boxed{+ ac}$ $\boxed{- bc}$ $\boxed{+ c^2}$

$\boxed{a^2}$ $\boxed{- 2ab}$ $\boxed{+ 2ac}$ $\boxed{+ b^2}$ $\boxed{- 2bc}$ $\boxed{+ c^2}$

11. Multiply:

$$m^4 - 3m^3 + 9m^2 - 27m + 81$$
$$m + 3$$

$\boxed{m^5}$ $\boxed{- 3m^4}$ $\boxed{+ 9m^3}$ $\boxed{- 27m^2}$ $\boxed{+ 81m}$

$\boxed{+ 3m^4}$ $\boxed{- 9m^3}$ $\boxed{+ 27m^2}$ $\boxed{- 81m}$ $\boxed{+ 243}$

$\boxed{m^5}$ $\boxed{}$ $\boxed{}$ $\boxed{}$ $\boxed{+ 243}$

12. Divide:

$$-63x^{10} - 18x^7 + 45x^6 - 99x^4 \div -9x^4 =$$

$\boxed{7x^6}$ $\boxed{+ 2x^3}$ $\boxed{- 5x^2}$ $\boxed{+ 11}$

13. Divide:

$$-12x^4y + 6x^3y^2 - 16x^2y^3 + 20xy^4 \div -2xy =$$

$\boxed{6x^3}$ $\boxed{- 3x^2y}$ $\boxed{+ 8xy}$ $\boxed{- 10y^3}$

14. The age of John is twice that of his brother James. What are their ages if equal results are obtained by subtracting 5 years from John's age and by adding 10 to James's age? Form the equation and solve.

$\boxed{\text{Let } X = \text{James's Age}}$

$\boxed{2X = \text{John's Age}}$

$\boxed{2X - 5} = \boxed{X + 10}$

$\boxed{2X - X} = \boxed{10 + 5}$

$\boxed{X = 15}$

$\boxed{2X = 30}$

Rules for Scoring

These rules must be used with the key of answers:

Problem 1. Allow two points for each correct term as shown in the rectangles in the key of answers. Maximum sum is 8.

Problem 2. Same as 1. Maximum sum is 8.

Problem 3. Allow one point for each correct term as shown in rectangles. Maximum sum is 6.

Problem 4. Allow one point for each correct term as shown in rectangles. Maximum sum is 4.

Problem 5. Allow one point for each set of parentheses correctly removed and one point for the correct collecting of terms as shown in rectangles. Maximum sum is 3.

Problem 6. Same as 5. Maximum sum is 3.

Problem 7. Allow one point for each correct transposition, one point for each collection of terms correctly in each member of the equation, and one point for the correct answer. Each step is shown in rectangles. Maximum sum is 5.

Problem 8. Same as 7. Maximum sum is 5.

Problem 9. Allow one point for each set of parentheses correctly removed, one point for collecting like terms in each member, one point for transposing correctly, and one point for the correct answer. Each step is shown in rectangles. If pupil transposed all terms before collecting any like terms and work is correctly done, allow maximum credit. Maximum sum is 9.

Problem 10. Allow one point for each correct partial product and one point for each correct term in the answer; each is shown in a rectangle. Maximum sum is 15.

Problem 11. Same as 10. Maximum sum is 16.

Problem 12. Allow one point for each correct term in the quotient as shown in the rectangles. Maximum sum is 4.

Problem 13. Same as 12. Maximum sum is 4.

Problem 14. Allow one point for the correct representations of the ages of James and John. Allow no credit for either if both are not given correctly, as shown in the rectangles.

Allow two points for the correct statement of the equation as shown in the rectangle. If an equivalent equation is given correctly, allow the same credit. Allow one point each for the correct values of James's and John's ages as shown in the rectangles. Maximum sum is 8.

Maximum sum for test is 98.

7.3 Geometry—Finding parts with parts given.[3]

Below are given theorems and exercises in which it will be necessary for you to do some constructions in order to prove your work. Be *sure* to leave all of your construction marks, write out every step in the proof, and give reasons for statements in the proof.

1. Find a point in a given line equidistant from two given points.
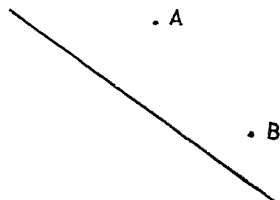
2. Prove: If two angles of a triangle are unequal, the sides opposite are unequal, and the greater side is opposite the greater angle.
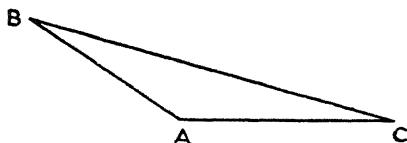
3. Prove: The sum of the three angles of a triangle is equal to a straight angle.
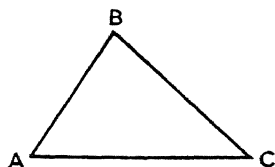
4. In a given triangle, ABC, B is twice C, and A is three times B. How many degrees are there in A?

---
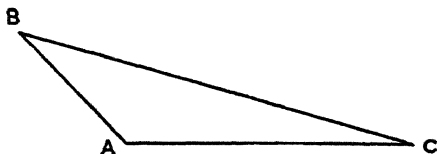
[3] Oxley, Delbert, *Objectifying the Scoring of Plane Geometry Tests*, master's thesis, University of Oklahoma, 1936. Used by permission of the author.

5. Construct through a given point, P, a line parallel to a given line AB.
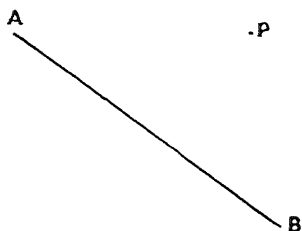
Rules for scoring:

1 point for each necessary line drawn with the ruler.

1 point for each necessary construction mark made with the compass, provided the stationary point of the compass is not moved from its stationary position in the construction. In bisecting a line, the stationary point of the compass has two positions; therefore, allow two points.

1 point for *each* correct statement in the hypothesis.

1 point for each correct statement of what is to be proved.

1 point for *each* necessary step that is correctly stated in the proof.

1 point for each correct *reason* given for each step.

In Problem 5 there are two correct constructions, one of which has a total of five points and the other a total of eight points. Allow a maximum of five points for either solution.

The maximum sums for theorems are:

Problem 1.......................... 5 points
Problem 2.......................... 16 points
Problem 3.......................... 12 points
Problem 4.......................... 9 points
Problem 5.......................... 5 points
Maximum total..................... 47 points

7.4 Proving theorem with list of reasons.

Directions. In the proposition which follows, YOU are to read the theorem, look at the drawing, and then do the following:

1. State briefly but completely what is given. Use the letters given in the drawing.
2. State briefly but completely what is to be proved. Use the letters given in the drawing.
3. Put NUMBERS in the left-hand column to indicate which PROOF STATEMENT should be used first, which should be used second, etc., just as you did in Proposition III and Proposition IV.
4. Put a zero on the blank line in front of all statements that should NOT be used in the proof.
5. On the page opposite each proposition you will find a list of REASONS. Each REASON IS NUMBERED. On the blank line after each statement in the proofs of the next two propositions YOU are to WRITE the NUMBER of the REASON which should be used to prove that statement, just as you did in Proposition I and Proposition II.

Theorem: If two angles of a triangle are equal, the sides opposite them are equal and the triangle is isosceles.

Given: 1. (_____)
2. (_____)

To prove: 3. (_____)
4. (_____)
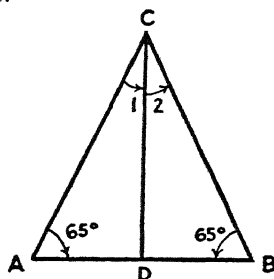
Proof:

Put numbers in this column:		Put reason number in this column:
A. ( )	Triangle ADC = triangle CDB.	( )
B. ( )	Angle A + angle B + angle C = a straight angle.	( )
C. ( )	Bisect angle C (using line CD).	( )
D. ( )	Angle 1 = angle 2.	( )
E. ( )	Angle 1 + angle 2 = angle C.	( )
F. ( )	$AC + AB > BC$.	( )
G. ( )	$AC = BC$.	( )
H. ( )	Triangles ADC and BDC are right triangles.	( )
I. ( )	Angle ADC = angle CDB.	( )
J. ( )	Angle A = angle B.	( )
K. ( )	$CD = CD$.	( )
L. ( )	Triangle ABC is isosceles.	( )
M. ( )	$AD = DB$.	( )

Q.E.D.

List of Reasons for Geometry Proposition

1. The bisector of the vertical angle of an isosceles triangle bisects the base.
2. If two right triangles have the hypotenuse and a side of one equal respectively to the hypotenuse and a side of the other, the triangles are congruent.
3. Identity.
4. The sum of all the angles formed at a point on a line and on one side of the line is a straight angle.
5. If two triangles have two angles of one equal respectively to two angles of the other, the third angles are equal.
6. All right angles are equal.
7. In the same circle or equal circles all radii or all diameters are equal.
8. In congruent triangles corresponding sides and corresponding angles are equal.
9. The whole is equal to the sum of all its parts and greater than any of its parts.
10. Hypothesis.
11. Any angle may be bisected.
12. A right triangle has one right angle.
13. If two triangles have two angles and the included side of one equal respectively to two angles and the included side of the other, the triangles are congruent.
14. If equals are added to equals, the sums are equal.
15. When one line is perpendicular to another, the angles they form are right angles.
16. An isosceles triangle has two equal sides.
17. The sum of two right angles is a straight angle.
18. An angle is bisected by constructing a line through the vertex so as to form two angles that are equal.
19. The sum of two sides of a triangle is greater than the third side.
20. Things equal to the same thing or to equal things are equal to each other.

Rules for Scoring

Each correctly completed blank counts one point. The maximum score is 26.

7.5 *Measuring angles.*

Directions. Below is a group of geometric figures. Study the given conditions in each figure referred to and write in the blank spaces

in the correspondingly numbered left-hand column the number of the item in the right-hand column necessary to make the statement true. Do any figuring necessary on scratch paper.

Fig. 1

(*Sample*) S. (*4*) △*AOD* ≅ △*BOC*

∠*X* (   ) degrees

Fig. 2

1. (   ) ∠*X* (   ) degrees

Fig. 3

2. (   ) ∠*X* (   ) degrees

Fig. 4

3. (   ) ∠*X* (   ) degrees

Fig. 5
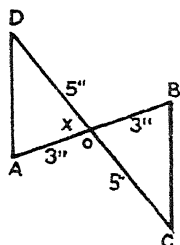
4. (   ) *AD = DB*

∠*X* (   ) degrees

1. 6 degrees
2. 9 degrees
3. 25 degrees
4. 30 degrees
5. 40 degrees
6. 60 degrees
7. 90 degrees

FIG. 1.
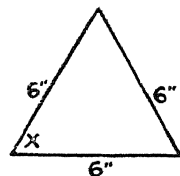
FIG. 2.
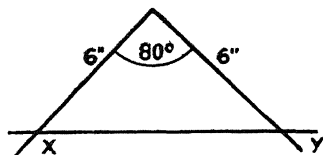
FIG. 3.
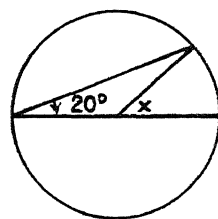
FIG. 4.
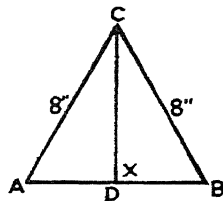
FIG. 5.

7.6 Finding angles in a figure.

Directions. Find the values of the lettered angles in the figure shown at the top of page 180. Place the value of the angle in the parentheses after the letter designating the angle. Notice that angle *A*, as sample *A*, is correctly answered.

				KEY	
(*Sample*)	A. Angle *A*	(*20°*) *A*	(	112°	) 1
	1. Angle *B*	(_____) 1	(	36°	) 2
	2. Angle *C*	(_____) 2	(	52°	) 3
	3. Angle *D*	(_____) 3	(	54°	) 4
	4. Angle *E*	(_____) 4	(	106°	) 5
	5. Angle *F*	(_____) 5	(	59°	) 6
	6. Angle *G*	(_____) 6	(	11°	) 7
	7. Angle *H*	(_____) 7			
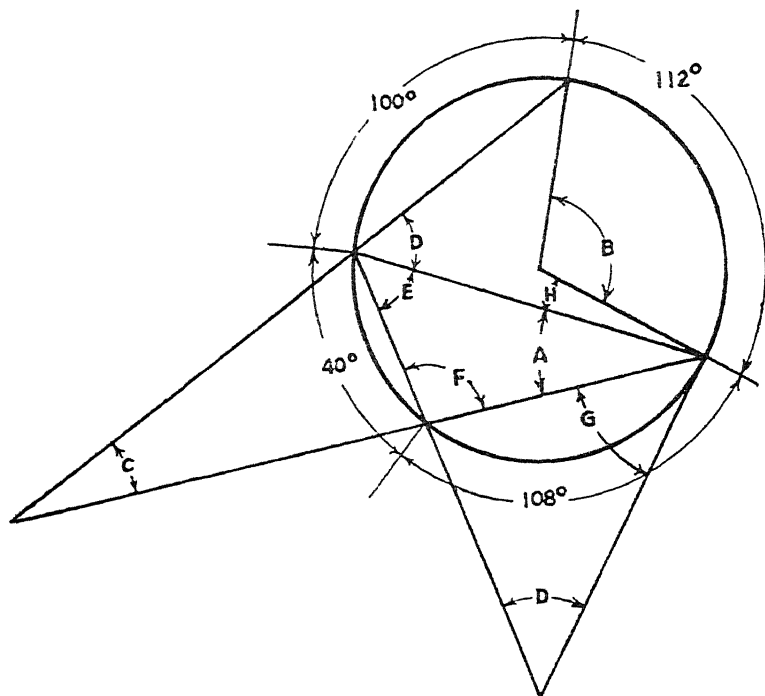
7.7 Finding dimensions of plane figures.

Directions. Using the data given in the *first two columns* of each line, give the answers in the third column.

Figure	Given Parts		Answers
1. Rectangle	Width = w, length = l	Area =	(_____) 1
2. Rectangle	Width = 12, length = 30	Area =	(_____) 2
3. Square	Side = s	Area =	(_____) 3
4. Square	Side = 6.4	Area =	(_____) 4
5. Triangle	Base = b, Altitude = a	Area =	(_____) 5
6. Triangle	Base = 9, Altitude = 11	Area =	(_____) 6
7. Equilateral triangle	Base = s	Altitude =	(_____) 7
8. Equilateral triangle	Base = 8	Altitude =	(_____) 8
9. Equilateral triangle	Side = s	Area =	(_____) 9
10. Equilateral triangle	Side = 6	Area =	(_____) 10
11. Trapezoid	Bases = b & b', Altitude = h	Area =	(_____) 11
12. Trapezoid	Bases = 10 & 8, Altitude = 6	Area =	(_____) 12
13. Trapezoid	Median = m, Altitude = h	Area =	(_____) 13
14. Trapezoid	Median = 10, Altitude = 6	Area =	(_____) 14
15. Isosceles rt. triangle	Leg = l	Area =	(_____) 15
16. Isosceles rt. triangle	Leg = 8	Area =	(_____) 16
17. Circle	Radius = r	Circumference =	(_____) 17
18. Circle	Radius = 12	Circumference =	(_____) 18
19. Circle	Radius = r	Area =	(_____) 19
20. Circle	Radius = 10	Area =	(_____) 20

8. Manual training.

8.1 Bill of material test in woodwork.[4]

Directions. Below is a working drawing of a table. In the blanks below make a complete bill of material for the lumber needed to make the table. Each piece is lettered. The table will indicate just what is wanted.
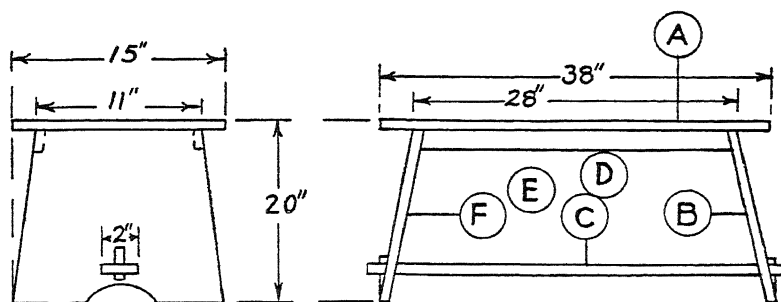
Complete Bill of Material

Piece	Number of Pieces	Length	Width	Number of Square Feet
A				
B				
C				
D				
E				
F				

Rules for scoring. There are twenty-four responses in the bill of material table. Score each correct response one unit. The correct bill of material is given below.

---

[4] Wallace, Archie M., *Objective Examinations in Manual Training,* master's thesis, University of Oklahoma, 1930. Used by permission of the author.

KEY

Complete Bill of Material

Piece	Number of Pieces	Length	Width	Number of Square Feet
A	1	38″	15″	3.95
B	1	20″	15″	2.08
C	1	38″	2″	.53
D	1	28″	2″	.39
E	1	28″	2″	.39
F	1	20″	15″	2.08

8.2 Tool and material test in woodworking.

Directions.   In woodworking tools and materials there are in a great many cases general names that cover several different kinds of things.   For example, under *saws* there are rip saws, cross-cut saws, keyhole saws, and so on.   Under each general name below, give the three most commonly used tools.

Planes	*Bits*	*Files*
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____

Screw Drivers	*Hammers*	*Rules*
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____

Squares	*Chisels*	*Nails*
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____

Screws	*Hinges*	*Scrapers*
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____

Rules for scoring.   Count each correctly filled blank one point.   Any correct name should be counted.   Do not count spelling.

8.3 Woodwork—Performance test.[5]

General instructions. This test is given to find out how well you can perform the fundamental processes involved in woodworking. On your desk you will find a block of wood upon which you will perform these processes. On the first blue-print page you will find a picture of how the job will look when it is finished. On the second and third blue prints you will find a working drawing which will give dimensions and show the shapes of the pieces. Read the working instructions and follow them carefully. Work as fast as you can, but place accuracy first. Be sure to follow the order of operations given in the instructions. After you have begun work, do not ask any questions. If you have any questions, ask them now, as they cannot be answered after the test begins.

Working instructions. Follow the order indicated.

1. Choose the best face, plane, square, true it, and mark it No. 1.
2. Plane, square, and true one of the faces adjacent to No. 1. Mark this face No. 2.
3. Plane, square, and true an end. Mark this No. 3.
4. From face No. 2 gauge a line around the block. Rip as near to this line as possible. Both pieces will be used.
5. On surface No. 1 lay out the mortise. On the edge of this piece lay out the center for the hole.
6. On end No. 3 of the other piece, lay out the tenon.
7. From surface No. 1 bore and chisel out the mortise.
8. Parallel to surface No. 1 bore the hole through the block.
9. Saw and chisel out the tenon.
10. Fit the tenon into the mortise and bore the hole through the tenon while it is in the mortise.
11. Write your name and grade upon face No. 1 of your block.

---

[5] Adapted from a trade test perfected by the Trade Test Division of the Committee on Classification of the Army and used by authority of the War Department. Letter, dated August 29, 1936, to Captain Henry D. Rinsland, A. G. D., Res.

TEST BLOCK

Face No. 1

Bore
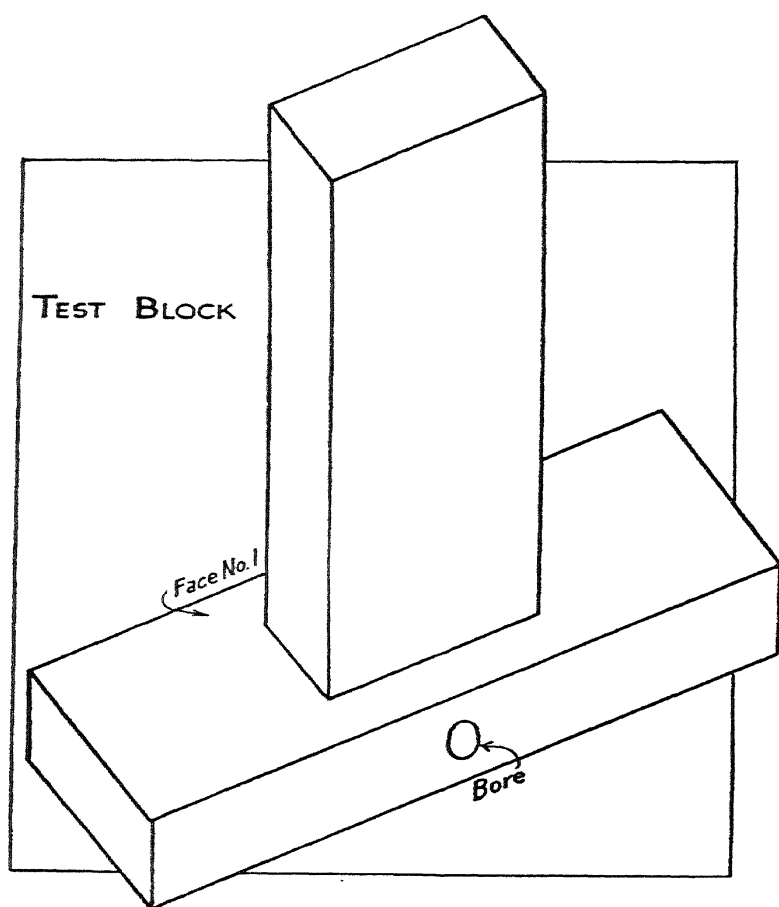
WORKING DRAWING
MORTISE MEMBER OF TEST BLOCK
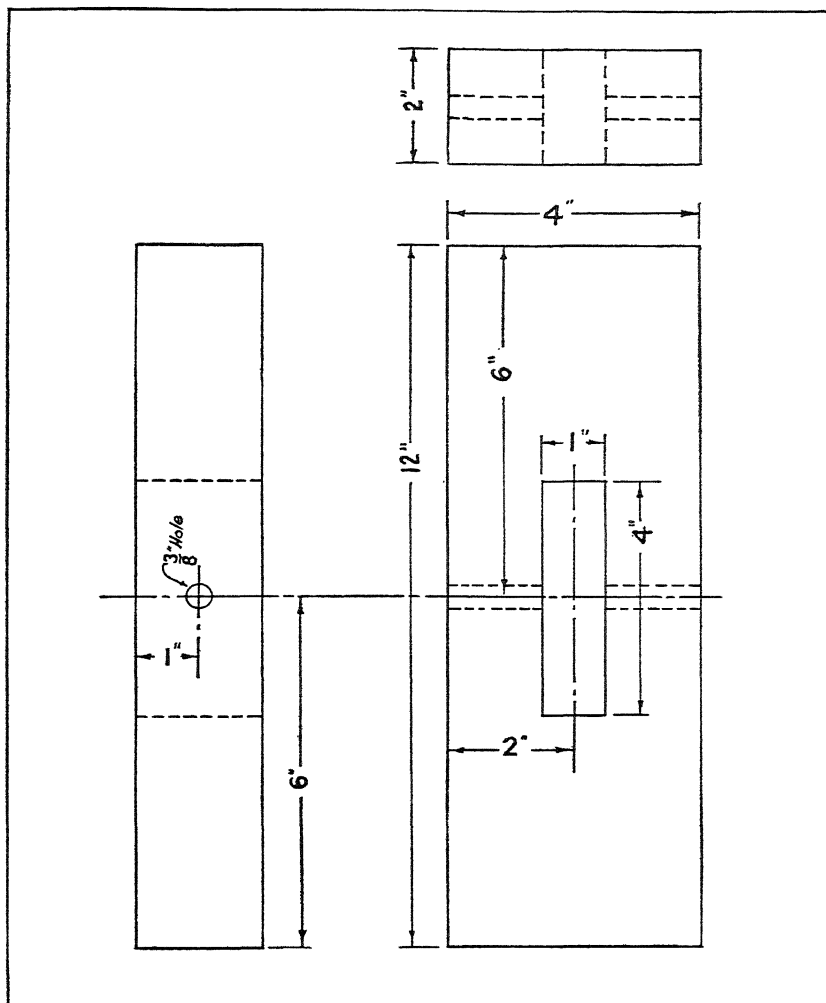
WORKING DRAWING
TENON MEMBER OF TEST BLOCK

$\frac{1}{2}$"

2" 1"

$\frac{1}{2}$"

4"

2"

12"
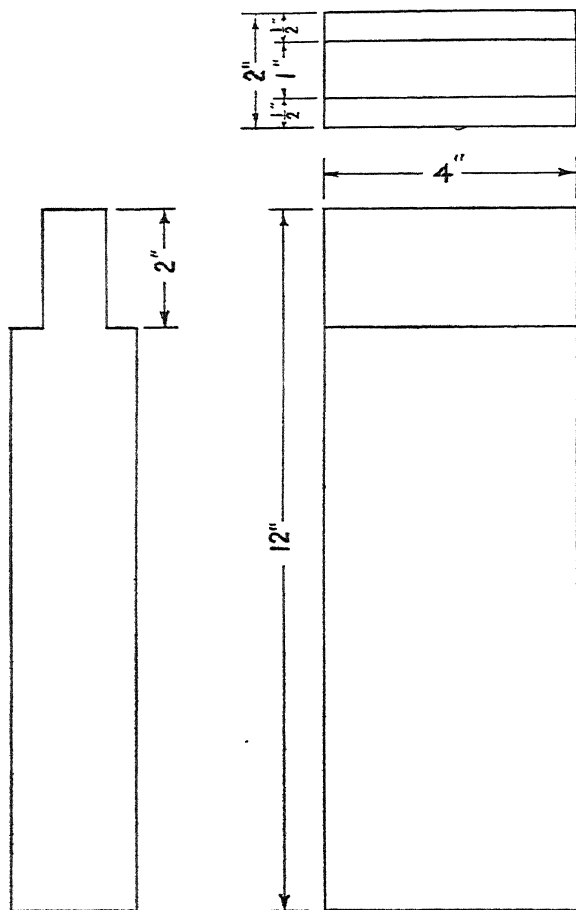
Purpose of Test

This test is designed for use in high school woodwork to test four qualities that should be learned in woodworking, namely:

1. The selection of tools to do a certain job.
2. Reading and interpreting instructions and working drawings.
3. Skill in the use of the tools selected.
4. Time efficiency in all of the above processes.

The score points are objective. The test is composed of the use of tools and processes that are found in regular practice and in texts on manual training. The skills and processes involved are listed below:

1. Selecting a working surface, end, and edge.
2. Planing a working surface, end, and edge.
3. Squaring a line around the test block.
4. Sawing parallel with the grain of the wood.
5. Sawing across the grain of the wood.
6. Laying out mortise and tenon, and laying out the center for a hole.
7. Through boring.
8. Chiseling a mortise.
9. Reading and interpreting instructions and working drawings.

Materials

The following tools should be on each bench:

1. Bench hook	8. Chisel $\frac{3}{4}''$ or 1''
2. Woodworking vise	9. Bit brace
3. Bench stop	10. Set of wood bits
4. Try-square	11. Mallet
5. Plane, jack or smooth	12. Block plane
6. Rule	13. Rip saw
7. Backsaw	14. Cut-off saw

All of the tools should be sharp and in good condition.

The block is an unfinished 4'' × 4'' × 16'' piece. Care should be used that all pieces are straight-grained, so that all will be of equal difficulty.

Instructions for Giving the Test
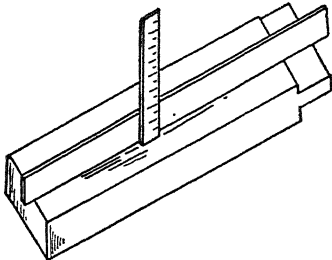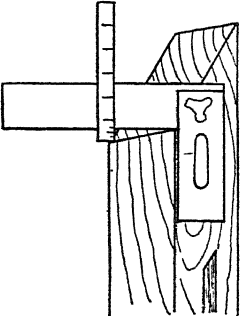
1. Distribute folders of instructions and blue prints with instructions that they are not to be read until orders are given.
2. Have all blanks with name, and so forth, filled in.
3. Read aloud the general instructions and working instructions, having the pupils follow silently.
4. Announce that no questions will be answered after the test has started.
5. Give the order to start.
6. As each block is finished, see that it has on it the name and grade of the pupil.

Scoring Instructions

The materials needed for scoring are a set of scoring tools and the scoring scale for assigning points. The tools are listed below. At first it may seem that the scoring will be a difficult job; but after a few blocks have been scored, the work will proceed very easily. The tools used in scoring are:

1. Steel scale graduated in 64ths of an inch.
2. One twelve-inch combination square.
3. A piece of $\frac{3}{8}''$ dowelling 5 inches long.
4. A straightedge at least 16″ long.

Scoring Scale

Work Unit	Procedure	Points
1. Trueness of surface No. 1	Lay a straightedge along each diagonal, along the center line of the length, and across the width. Find the maximum amount of all 3 measurements between the surface and the straightedge in 64ths of an inch. This will determine the score.	No light showing... 10 Not more than $\frac{1}{64}''$ off............... 5 Not more than $\frac{2}{64}''$ off............... 2 Not more than $\frac{3}{64}''$ off............... 1 More than $\frac{3}{64}''$ off.. 0

Fig. 1

Work Unit	Procedure	Points
2. Squareness of end No. 3 with surface No. 1 and edge No. 2	Place the beam of the square against No. 1 and test the squareness of No. 3 along the entire end. Find the distance off, in 64ths of an inch, as shown in Fig. 2.	No light............ 5 Not more than $\frac{1}{64}''$ off............... 4 Not more than $\frac{2}{64}''$ off............... 3 Not more than $\frac{3}{64}''$ off............... 2 More than $\frac{3}{64}''$ off 0

Fig. 2

Work Unit	Procedure	Points
3. Length of blocks	Measure length of blocks and score the same amount off if long or short, according to scale of points on right.	Exactly 12''........ 5 Not more than $\frac{1}{64}''$ off............... 4 Not more than $\frac{2}{64}''$ off............... 3 Not more than $\frac{3}{64}''$ off............... 2 More than $\frac{3}{64}'$ off.. 0

Scoring Scale (Continued)

Work Unit	Procedure	Points	
4. Width of blocks	Measure width of blocks and score the same if too wide or too narrow, according to scale of points on the right.	Exactly 4″..........	4
		Not more than $\frac{1}{64}$″ off................	3
		Not more than $\frac{2}{64}$″ off................	2
		More than $\frac{2}{64}$″ off..	0
5. Squareness and trueness of surface No. 2 on both pieces	(a) Lay a straightedge along each diagonal and along the center line of the width. The divergence in 64ths of an inch will determine the score. See Fig. 1.	No light...........	8
		Not more than $\frac{1}{64}$″ off................	6
		Not more than $\frac{2}{64}$″ off................	4
		Not more than $\frac{3}{64}$″ off................	2
		More than $\frac{3}{64}$″ off..	0
	(b) Place the beam of the square against surface No. 1 and test for squareness along the whole edge. See Fig. 3.	No light...........	4
		Not more than $\frac{1}{64}$″ off................	3
		Not more than $\frac{2}{64}$″ off................	2
		More than $\frac{2}{64}$″ off..	0

Fig. 3

Work Unit	Procedure	Points	
6. Squareness of end No. 3 with surface No. 1 and edge No. 2	Place the beam of the square against surface No. 2 with the blade along the center of No. 3. Find the amount of divergence in 64ths of an inch, as in Fig. 2.	No light...........	5
		Not more than $\frac{1}{64}$″ off................	4
		Not more than $\frac{2}{64}$″ off................	3
		Not more than $\frac{3}{64}$″ off................	2
		More than $\frac{3}{64}$″ off..	0
7. Thickness of blocks	This will tell how well the ripping was done. Measure the thickness at four points: one corner, middle of one side, middle of one end, and middle of other side. The amount off will determine the score, according to the scale.	Exactly 4″ all points	8
		Not more than $\frac{1}{64}$″ off................	6
		Not more than $\frac{2}{64}$″ off................	5
		Not more than $\frac{3}{64}$″ off................	4
		More than $\frac{3}{64}$″ off..	0

Scoring Scale (Continued)

Work Unit	Procedure	Points
8. Squareness of ripped surfaces with edge No. 2.	Test and score this surface the same way that surface No. 2 was tested and scored. (Item 5a).	Score as in No. 5a No light (Maximum) 8
9. Mortise	(a) The distance of the sides of the mortise from the sides of the block should be 1". Measure deviations from this in 64ths of an inch. Score deviation as per scale on right.	All exactly 1"....... 10 Not more than $\frac{1}{64}$" off............... 9 Not more than $\frac{2}{64}$" off............... 8 Not more than $\frac{3}{64}$" off............... 7 Not more than $\frac{4}{64}$" off............... 6 More than $\frac{4}{64}$" off.. 0
	(b) The mortise should be 1" × 4" on both surfaces. The deviation from this in 64ths of an inch will determine the score.	No deviation....... 7 Not more than $\frac{1}{64}$" off............... 4 Not more than $\frac{2}{64}$" off............... 2 More than $\frac{2}{64}$" off.. 0
10a. Tenon size	Test as in No. 9b.	Score as in No. 9b No. deviation (Maximum)............. 7
10b. Squareness with block.	Place the beam of the square on the surface of the tenon as indicated in Fig. 4 and measure the deviation from square in 64ths of an inch.	Perfect............. 4 Not more than $\frac{1}{64}$" off............... 3 Not more than $\frac{2}{64}$" off............... 2 Not more than $\frac{3}{64}$" off............... 1 More than $\frac{3}{64}$" off.. 0
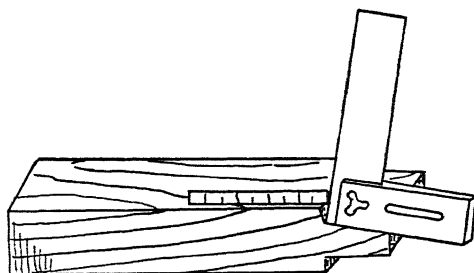
Fig. 4

Scoring Scale (Continued)

Work Unit	Procedure	Points	
11. Bored hole; placement.	(a) From surface No. 1 measure the distance of center of the hole; also measure distance from end No. 3. The divergences will determine the score.	No divergence......	5
		Not more than $\frac{1}{64}''$ off...............	3
		Not more than $\frac{2}{64}''$ off...............	2
		Not more than $\frac{3}{64}''$ off...............	1
		More than $\frac{3}{64}''$ off..	0
	(b) Take the 5" dowel rod and thrust it into the hole until 4" of it stick out. Place the beam of the square on the edge as shown in Fig. 5 and measure divergences in 64ths of an inch.	Perfect............	5
		Not more than $\frac{1}{64}''$ off...............	4
		Not more than $\frac{2}{64}''$ off...............	3
		Not more than $\frac{3}{64}''$ off...............	2
		Not more than $\frac{4}{64}''$ off...............	1
		More than $\frac{4}{64}''$ off..	0

Fig. 5

	(c) If the $\frac{3}{8}''$ dowell pin fits the hole perfectly, the hole is of correct size.	Correct............	2
		Any other..........	0
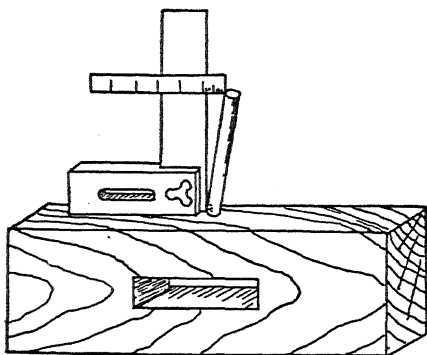
Maximum Score for Each Section

1. Trueness of surface No. 1................................ 10
2. Squareness of end No. 3 with surface No. 1 and edge No. 2... 5
3. Length of blocks.. 5
4. Width of blocks... 4
5. Squareness and trueness of surface No. 2 on both pieces. · · · 12
6. Squareness of end 3 with surface 1 and edge 2............ 5
7. Thickness of blocks.................................... 8
8. Squareness of ripped surfaces with edge 2................ 8
9. Mortise: (a) placement, (b) size......................... 17
10. Tenon: (a) size, (b) squareness with block................ 11
11. Bored hole: (a) placement, (b) perpendicular, (c) size....... 12

Total................ 97

8.4 Mechanical drawing—Technical sketching.

Directions.   Below is a picture of a machinist's vise.   Assume that you have been given the vise itself to draw.   The drawing of the vise is to be twice as large as the picture.   Sketch and dimension three views correctly and completely.
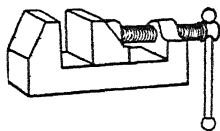
Student: Make the sketches here.

Scoring Key

Directions. There are 20 dimensions needed to describe the vise completely. Score one point for each correct dimension. There are 50 lines in the three views. Score one point for each correct line. Score one point for each of the three views correctly placed. Maximum score is 73 points.

8.5 Mechanical drawing—Reading test.[6]

Directions. Below on the left you will see two views of a work bench with a number of dimensions given. From these two views, find the sizes for the lettered dimensions on the oblique drawing to the right. You will not find all dimensions on the two left views. Fill in all the blank lines, *A* to *O*, that you can. Place an X on the line where dimensions are not given.

A. (_____)   F. (_____)   K. (_____)
B. (_____)   G. (_____)   L. (_____)
C. (_____)   H. (_____)   M. (_____)
D. (_____)   I. (_____)   N. (_____)
E. (_____)   J. (_____)   O. (_____)

---
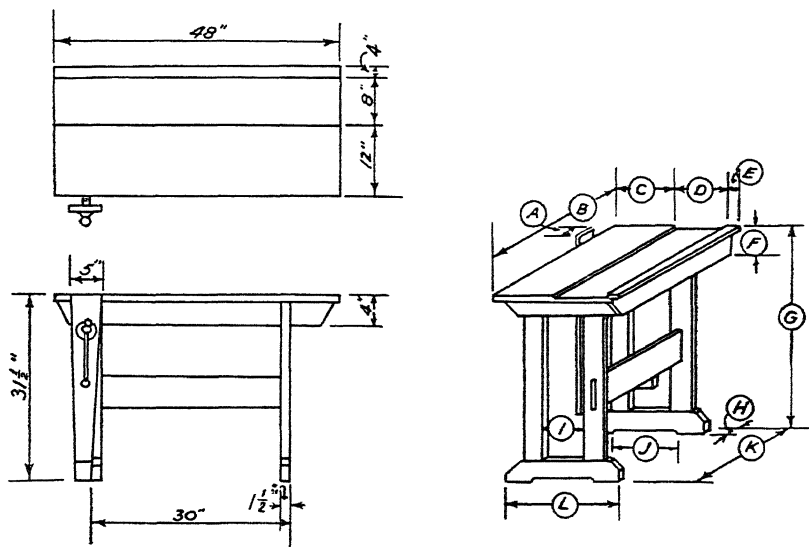
[6] Wallace, Archie M., *op. cit.*, 1930.   Used by permission of the author.

8.6 Mechanical drawing—Missing line.

Directions. In the following group of three-view drawings, there are a number of lines missing. Use the triangle and pencil and put in the missing line. The front view is correct in every case.
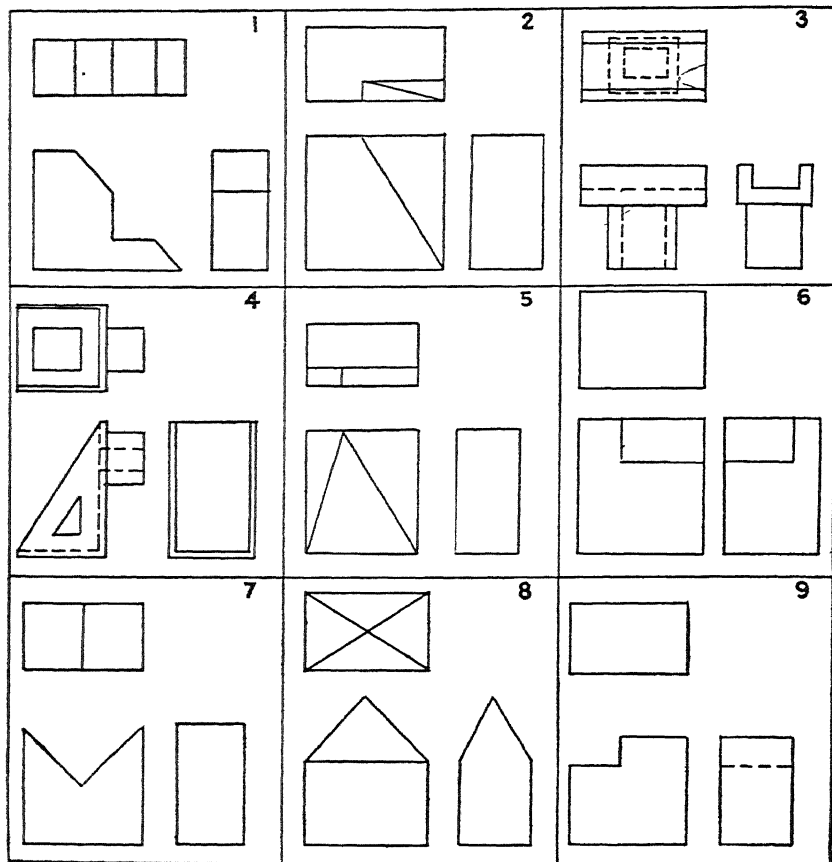
Directions.   Score for numbers 1, 2, 5, 7, 8, and 9: one point each if the line is in place according to the line in the key.   Score for 3, 4, and 6: 2 points each if both lines are in place according to the line in the key, and one each if one of the lines is in place.

1	2	3
4	5	6
7	8	9

8.7　Mechanical drawing—Identification of parts.[7]

Directions.　Put the name of the numbered part on the line of the same number.
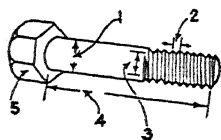
1. (_____)
2. (_____)
3. (_____)
4. (_____)
5. (_____)
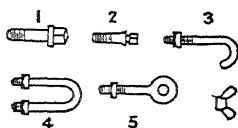
1. (_____)
2. (_____)
3. (_____)
4. (_____)
5. (_____)
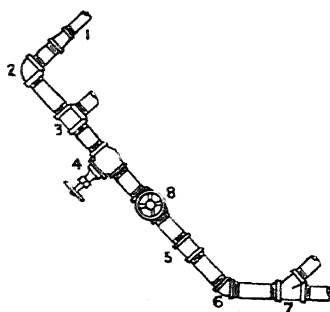
1. (_____)
2. (_____)
3. (_____)
4. (_____)
5. (_____)
6. (_____)
7. (_____)
8. (_____)

9.　Music.

9.1　Measuring intervals.

Directions.　Below are given four measures of music.　You are to determine the specific interval between each two notes bracketed and numbered.　These numbers correspond to the blanks below.　When an interval is calculated, use the interval key to determine its corresponding number.　Place this number in the blank to the left.　Place the specific step name of the interval in the correspondingly numbered blank to the right.

(A) (1)　(2) (3)　(4)　(5) (6) (7)　(8)　(9) (10)

---
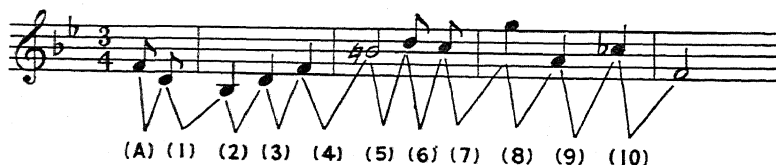
[7] Wallace, Archie M., *op. cit.*, 1930.　Used by permission of the author.

Interval Number Key

1. Major interval
2. Minor interval
3. Perfect interval
4. Diminished interval
5. Augmented interval

KEY	A. (*2*)	A. (*third*)	KEY
1. (1)	1. ( )	1. (_____)	1. (third)
2. (1)	2. ( )	2. (_____)	2. (third)
3. (2)	3. ( )	3. (_____)	3. (third)
4. (5)	4. ( )	4. (_____)	4. (fourth)
5. (2)	5. ( )	5. (_____)	5. (third)
6. (1)	6. ( )	6. (_____)	6. (second)
7. (3)	7. ( )	7. (_____)	7. (fifth)
8. (2)	8. ( )	8. (_____)	8. (seventh)
9. (4)	9. ( )	9. (_____)	9. (third)
10. (4)	10. ( )	10. (_____)	10. (fifth)

Rules for scoring. Count each correct response as one point. Do not count off for capitalization or spelling.

9.2 Musical terms stated in analogous situations.

Directions. Below is given a number of statements with one word lacking to make the comparison true. Fill in the word making the statement true in the numbered blank. The sample is answered correctly.

		KEY
A. A note is to pitch as a rest is to (*A*).	(*silence*).*A*	
1. Piano is to forte as legato is to (1).	(_____) 1	(staccato) 1
2. Intonation is to pitch as dynamic is to (2).	(_____) 2	(intensity) 2
3. Ritardando is to allargando as decrescendo is to (3).	(_____) 3	(diminuendo) 3
4. Rhythm is to music as meter is to (4).	(_____) 4	(notation) 4
5. Falsetto is to the voice as (5) is to the violin.	(_____) 5	(harmonics) 5

Directions for scoring. Give one point for each correct response. Do not count spelling unless the word is obviously wrong. Spelling could be tested in a separate spelling test.

10. Reading.

10.1 First grade reading, all directions by teacher.

Directions to teacher. Read the directions slowly and carefully. Direction 1 goes with sentence 1, direction 2 with sentence 2, and so on. After each direction, pause long enough for the children to execute what is to be done. If children do not recognize the numbers, the teacher should point to the correct line, holding up a test. In the first months of school, children may not be able to write their names; so the teacher may have to identify the papers by writing the pupils' names on the papers before they are passed out.

Directions (*To be read to the pupils*):

1. Draw a line under the word that tells who can play. (See that everyone does this right. Do not help with answers to any of the others.)
2. Draw a line under the word that tells what a dog can do.
3. Draw a line under the word that tells who is little.
4. Draw a line under the word that tells the color of an apple.
5. Draw a line under the word that tells what can hop.
6. Draw a line under the words that tell what the boy plays with.
7. Draw a line under the word that tells how many kittens Mother Cat has.
8. Draw a line under the word that tells who is big.
9. Draw a line under the words that tell what Baby plays with.
10. Draw a line under the words that tell who can run.
11. Draw a line under the word that tells what the girl plays with.
12. Draw a line under the words that tell where the boy and girl went.
13. Draw a line under the word that tells what the kitten likes.
14. Draw a line under the word that tells the kind of house mother has.
15. Draw a line under the word that tells the color of the house.

	Key
1. A girl can play.	1. girl
2. A dog can run.	2. run
3. The baby is little.	3. baby
4. An apple is red.	4. red
5. A rabbit can hop.	5. rabbit
6. The boy plays with a ball.	6. ball
7. Mother Cat has two kittens.	7. two
8. Father is big.	8. Father
9. Baby plays with the kitten.	9. kitten
10. A boy can run.	10. run
11. The girl plays with a doll.	11. doll
12. The boy and girl went to school.	12. to school
13. A kitten likes milk.	13. milk
14. Mother has a big house.	14. big
15. The house is brown.	15. brown

10.2 First grade reading with pictures.

Directions   (*To be read to the children*).   Here are some questions for you to answer.   Look at the picture by each question and then draw a line under the words that tell the answer.   I will do one for you.

(*Sample*) A. Where am I?   by the tree   in the car

at the table   on the house.

1. What am I doing?   running   jumping

swinging   eating.

2. What am I?   a boy   a girl   a cat   a pig.

3. Where am I?   at the table

on the hill   in the woods   in bed.

4. What is good for you?   cake   milk   pie

candy.

5. What do girls like?   tops   bats   balls

dolls.

10.3 Naming pictures.

For very young children. This form is limited in its usefulness.

Directions. Write the name of each picture opposite the picture.
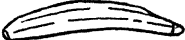
10.4 Naming fruit.

Directions. Find the word that goes with the picture and draw a line from the word to the picture. The first one is drawn to show you how to do the others.
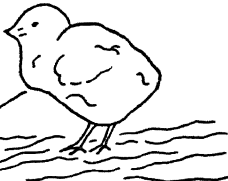
Note. Directions should be read by the teacher.

1.   apple

2.   banana

3.   cherry

4.   pear

5.   orange

6.   cat

7.   box

10.5 Matching words with pictures.

Directions. Draw a line from the picture of the word to the word. The first one is correctly done.

Note. Directions should be read by the teacher.

owl
turkey
hen
chicken

1. rabbit   2. doll
   dog   ball
   horse   wagon
   cow   book
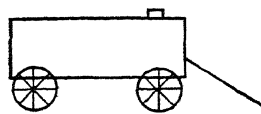
10.6 *Primary vocabulary recognition.*

Directions. Below is given a list of words. Draw a line under every word on the line that begins with a letter like the first letter of the first word of the line. (*The teacher should illustrate these directions by writing several samples on the blackboard.*)

A. man:	boy	<u>me</u>	<u>milk</u>	cat
1. run:	rat	sat	ran	can
2. for:	girl	fat	funny	hurt
3. kitten:	kill	hat	kind	king
4. sing:	ring	sang	rang	song
5. barn:	bat	ball	large	boy

Rule for scoring. Each correctly underscored word counts one point.

11. Science.

11.1 *Biology—Diagram of frog.*

Directions. A diagram is given below of the urogenetal system of a frog. Put the correct names of the organs in the parentheses to the right, which are numbered to correspond with the numbers of the organs.

(*Sample*) 1. (*vasa efferentia*)
2. (_____)
·3. (_____)
4. (_____)
5. (_____)
6. (_____)
7. (_____)
8. (_____)

KEY
(testes)
(kidney)
(adrenal bodies)
(oviduct)
(ureter)
(seminal vesicle)
(bladder)

Rules for scoring. Score each correct response one point. Do not count off for spelling unless the word is obviously wrong.

11.2 Biology—Diagrams of leaves of trees.

Directions. Below is given a list of names of common trees. In the space provided at the right of the names of the trees, do two things: first, write in the parentheses the name of the leaf shape and the name of the type of margin; second, under the names, draw small illustrations.

Trees (Sample)	Give leaf shape.	Give type of margin.		KEY	
A. Elm	(lanceolate)	(twice serrate)			
1. Ash	(_____)	(_____)	1.	(lanceolate)	(entire)
2. Birch	(_____)	(_____)	2.	(ovate)	(dentate)
3. Red bud	(_____)	(_____)	3.	(cordate)	(entire)
4. Peach	(_____)	(_____)	4.	(oblong- lanceolate)	(serrate)
5. Cottonwood	(_____)	(_____)	5	(ovate)	(crenate)

Rules for scoring. Score each correct response one point. Do not count off for spelling unless it is obviously wrong. Do not grade quality of drawing. The maximum score is 20 points.

11.3 Biology—Recognizing class and order.

Name	Class	Order	
1. Mosquitoes	(_____)	(_____)	1
2. Snakes	(_____)	(_____)	2
3. Cats	(_____)	(_____)	3
4. Paramecium	(_____)	(_____)	4
5. Turtles	(_____)	(_____)	5

Rules for scoring. Score each correct response one point. Do not count spelling unless the word is obviously wrong. The maximum score for the test is 10 points.

11.4 Biology—Diagram of plant.

Directions. Below are two plants. Study them carefully and list in the blanks to the right the three most important characteristics in which they differ.

1. (_____

_____)

2. (_____

_____)

3. (_____

_____)

KEY

1. (parallel vs. net-veined leaves   )
2. (five vs. three flower parts   )
3. (fibrous vs. bulbous roots   )

Rules for scoring. Do not count off for misspelled words. The statements may be in any order. Score one point for each correct response.

11.5 Chemistry—Steps in making mercuric iodide.

Directions. Below are given the steps for the preparation of mercuric iodide. Rearrange them in the correct order by placing a *1* in the parentheses before the first step, *2* before the second, and so forth.

1. (   ) Dissolve a crystal of potassium iodide in a test tube and a crystal of mercuric chloride in another test tube.
2. (   ) Secure potassium iodide and mercuric chloride crystals.
3. (   ) Gradually add mercuric chloride solution to the potassium iodide solution in the third test tube.
4. (   ) Pour a little potassium iodide solution into a third test tube.
5. (   ) Secure a mortar, a pestle, and three test tubes.

Rules for scoring. The special scoring plan described on page 144 should be applied to this test. The maximum score for 5 items in a group is 12 points.

11.6 Properties of chemicals.

Directions. Below in the left-hand column is a list of chemical names. Across the top of the sheet is a list of chemical properties. Check or fill in the proper places. *A* and *B* are correctly done.

Chemical Names	Com-pound	Ele-ment	Gas	Li-quid	Sol-id	Met-al	Non-Met-al	Sym-bol or For-mula
A. Oxygen		√	√				√	*O*
B. Sodium Chloride	√					√	√	*NaCl*
1. Chlorine								
2. Ferric Sulphate								
3. Aluminum								
4. Magnesium Chloride								
5. Lead								

Rule for scoring. Each correctly checked space counts one point.

11.7 Problem solving in chemistry.[8]

Directions. Below is a group of problems. After each *Operation* place the answer in the column *Answer*. Notice the *Example*, which is correctly done. Do your calculations on the back of this sheet.

(*Example*) *A*. A man who is 60 inches tall is how many feet tall?

Operation	Deduction	Answer	Points	Score
First	One foot = 12 inches	*12 in.*	one	
Second	60 ÷ 12	*5 ft.*	one	

1. How many grams of hydrogen may be produced by completely reacting ten grams of zinc with HCl?

Operation	Deduction	Answer	Points	Score
First	Complete and balance: $Zn + HCl \rightarrow (1) + (2)$	(1) (2)	4	
Second	Mol. Wt. of known → (1) Mol. Wt. of unknown → (2)	(1) (2)	2	
Third	Actual Wt. of known →		1	
Fourth	Ratio:		1	
Fifth	Final answer		1	

2. How many liters of chlorine gas may be prepared by treating 5 gm. of HCl with MnO_2? Equation: $4HCl + MnO_2 \rightarrow MnCl_2 + Cl_2 + 2H_2O$.

---

[8] House, Otis W., *A Measure of the Amount of Learning in High School Chemistry*, master's thesis, University of Oklahoma, 1934. Used by permission of the author.

Operation	Deduction	Answer	Points	Score
First	Formula for known → Formula for unknown →	———	2	
Second	Molecular Wt. for known Molecular Wt. for unknown	———	2	
Third	Grams for known → Volume of Mol. Wt. of unknown	———	2	
Fourth	Liters of chlorine → Cubic centimeters of unknown	———	2	

3. What volume will five liters of hydrogen occupy at sea level, if taken from a place where the pressure is 720 mm. of Hg and the temperature is 70°F?

Operation	Deduction	Answer	Points	Score
First	Formula		1	
Second	Substitution: P_1 (1), V_1 (3), T_1 (5) P_2 (2), V_2 (4), T_2 (6)	(1) (2) (3) (4) (5) (6)	6	
Third	Final Answer		1	

11.8 Recognition of scientific apparatus.[9]

Directions. Below is some scientific apparatus. Each article is numbered. Place the name of the article in the space provided on the right-hand side of the page in the correspondingly numbered blank.

1. (_____)
2. (_____)
3. (_____)
4. (_____)
5. (_____)
6. (_____)
7. (_____)
8. (_____)
9. (_____)
10. (_____)
11. (_____)
12. (_____)
13. (_____)
14. (_____)
15. (_____)
16. (_____)
17. (_____)
18. (_____)
19. (_____)
20. (_____)

11.9 Geography.

Place after each statement the proper letter located on the diagram. The sample, A, is correctly answered.
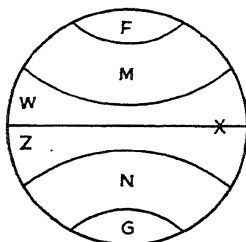
(Sample) A. Equator   (X)
        1. North Frigid zone   (   )
        2. South Temperate zone   (   )
        3. North Temperate zone   (   )
        4. South Frigid zone   (   )

[9] House, Otis W., op. cit., 1934. Used by permission of the author.

11.10 Hygiene.

Directions. Arrange the following structures in order of the general path that the food takes by placing in the parentheses *1* for the first passage, *2* for the second, and so on.

1. (   ) pharynx
2. (   ) mouth
3. (   ) anus
4. (   ) esophagus
5. (   ) large intestine
6. (   ) duodenum
7. (   ) small intestine

Rules for scoring. The special scoring plan described on page 144 should be used. The maximum score for 7 items in a group is 24 points.

11.11 Naming parts of battery.

Directions. A diagram is given below. Identify the numbered parts by writing the names of these parts on the correspondingly numbered blanks to the right.
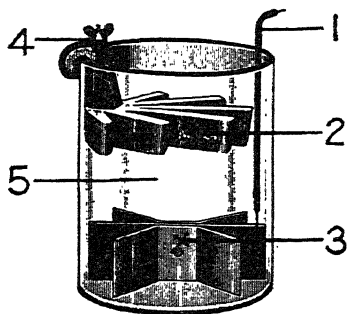
(_____) 1

(_____) 2

(_____) 3

(_____) 4

(_____) 5

11.12 Describing apparatus and use.[10]

Directions. In each of the following sentences, one or more words are needed in the numbered blank spaces to make the sentences complete and true. Place that word or words in the correspondingly numbered blank to the right.

Figure 1
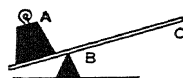
FIG. 1.

1. In this lever the power or force is applied at (1). (_____) 1
2. The fulcrum is placed at the point marked (2). (_____) 2
3. The mechanical advantage of this lever as drawn is (3) than 1. (_____) 3

Figure 2
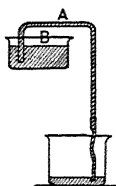
FIG. 2.

4. This figure illustrates the facts of the (4). (_____) 4
5. The greatest distance that portion A of the tube can be placed vertically above the level of the water at B, if the apparatus is to work successfully, is about (5). (_____) 5

Figure 3
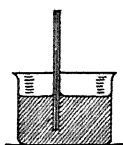
FIG. 3.

6. This diagram illustrates the facts of (6). (_____) 6
7. The rise of liquids in small tubes is (7) proportional to the (8). (_____) 7
  (_____) 8

Figure 4
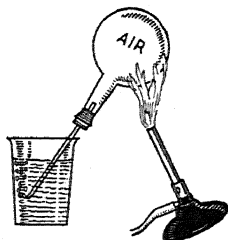
FIG. 4.

8. This apparatus illustrates the (9) of gases when heated. (_____) 9
9. When the flame is taken away, the water in the vessel will (10) in the tube, owing to the (11) of the air as its (12) is lowered. (_____)10
  (_____)11
  (_____)12

---

[10] Used by permission of the State Department of Public Instruction of Oklahoma.

11.13 Recognition of organ, tissue, and cell in botany.

Directions. The names of several plant structures are listed below. Place an O at the left of each name of an organ, a T at the left of each name of a tissue, and a C at the left of each name of a cell. Place an X at the left of the name if it is *not* the name of an organ, a tissue, or a cell.

Key	(Sample) A. (T) epidermis
1. (O)	1. ( ) carpel
2. (x)	2. ( ) chlorophyll
3. (C)	3. ( ) fiber
4. (O)	4. ( ) leaf
5. (T)	5. ( ) parenchyma
6. (x)	6. ( ) photosynthesis
7. (T)	7. ( ) root cap
8. (x)	8. ( ) stoma

Rules for scoring. Each correct response counts one point. Illegible responses will be counted as incorrect. Misspelling will not be counted off.

11.14 Variation of true-false in chemistry.

This form has been suggested by Andruss.[11] This test is built so that there will be only one incorrect word in each false item.

This variation of true-false may be used in any subject adaptable to true-false. It is probably superior to the regular true-false, as the pupil must know what is false and how to correct the false statement.

Directions. Below is given a group of complete statements. Some are true and some are false. If the statement is true, mark a T in the parenthesis at the left. But if the statement is false, one word can be changed to make it true. Mark an F in the parenthesis at the left, underscore the one word that makes it false, and write the word that will make it true in the parenthesis at the right.

---

[11] Andruss, Harvey A., "True and False Correction Test," *Balance Sheet*, Vol. 16 (October, 1934), p. 61.

(Sample)	KEY
A. (*F*) The ability of gaseous molecules to move is known as vaporization. (*volatilization*)	
1. ( ) A gas under constant temperature will vary inversely with the pressure. (＿＿＿＿＿)	1. (T)
2. ( ) The force which attracts like molecules together is known as diffusion. (＿＿＿＿＿)	2. (F) (cohesion)
3. ( ) Kinetic energy is energy in motion. (＿＿＿＿＿)	3. (T)
4. ( ) Rate of chemical change depends upon four things. (＿＿＿＿＿)	4. (T)
5. ( ) The simple substances are called mixtures. (＿＿＿＿＿)	5. (F) (elements)

Scoring. Score one point for each correct *T* and one point for each correct *F*. In all *F*-statements, count one point for each correct word underscored and one point for the correct word written. The maximum score for this test is 9 points.

11.15 Check list form.

Directions. Place a cross (X) before each incorrect phrase and a *C* before each correct phrase.

1. ( ) a warm-blooded frog	6. ( ) a dependent fungus
2. ( ) a fish without a lung	7. ( ) a parasite growing in the ground
3. ( ) a warm-blooded fish	
4. ( ) an egg-laying mammal	8. ( ) a metazoa without a nucleus
5. ( ) a mammal which swims	

12. Social science.

12.1 Order of laws.

Directions. Below is a list of bodies of laws which are not arranged in their order of superiority. In the parentheses preceding each body

of laws write the number indicating its rank of superiority in respect to the others.

			KEY
1.	( )	State laws.	(3)
2.	( )	Federal laws.	(2)
3.	( )	United States Constitution.	(6)
4.	( )	Municipal law.	(5)
5.	( )	State constitution.	(1)
6.	( )	Federal administrative law.	(7)
7.	( )	State administrative law.	(4)

Rules for scoring. The special scoring device described on page 144 should be used for this test. The maximum score for 7 items in a group is 24 points.

12.2 Relationship of units of government.

Directions. Below is given a number of the units making up our government. These units have certain direct checks upon one another. Draw a line connecting units between which there exists a direct check. One line is correctly drawn as an illustration.
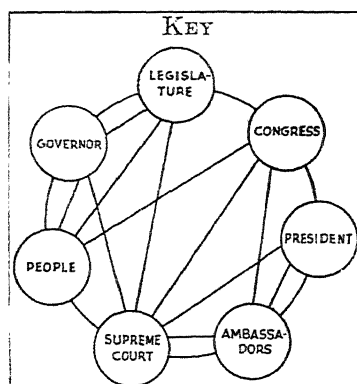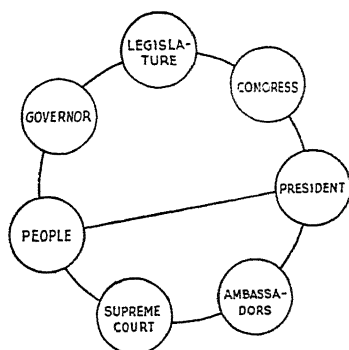
Rules for scoring. Count each correct response two points. For every wrong response, subtract one point.

12.3 Economic theory and philosophers.[12]

Directions. Below are listed the concepts of various philosophers concerning value, private property, wealth, nature, and sterility. Under each of the headings (I–V, incl.) may be found the concept of each philosopher. Place the number which precedes this concept

---

[12] The author wishes to thank Professor C. Dan Proctor, East Central State Teachers' College, Ada, Oklahoma, for permission to use this test.

in the blank space beneath the philosopher's name and on the horizontal line with the proper heading (value, wealth, and so forth). A number may appear in more than one space, because several philosophers may have the same concept. The value concept of Thomas Aquinas is completed as a sample. Fill in the other blank spaces in the table in a similar manner.

Concept	Philosophers					
	Thomas Aquinas	Thomas Filmer	David Hume	John Locke	François Quesnay	Adam Smith
Value	*3*					
Private Property						
Wealth						
Nature						
Sterility						

I. Value concepts:
  1. Man is entitled to the fruits of his labor.
  2. Comfort and luxury may be had for the asking.
  3. The value of an article is determined by the amount of labor necessary to produce it.
  4. Man is entitled to a mere subsistence, because nature alone produces a surplus value.
  5. The courts of justice shall decide the equity.
  6. Man is entitled to the fruits of his labor, but there shall be a contribution to society through the government.
  7. Value is determined by scarcity of the article.
  8. Value is of no consequence to the individual, because the rights of individuals are delegated.

II. Private property concepts:
  1. Man's ownership shall be protected.
  2. Man is not entitled to own anything, because all goods belong to the sovereign powers.
  3. The middle classes shall have sole ownership.
  4. The Pope (papacy) shall own or control all property.
  5. Equal rights of citizens and a common division of all properties.

6. Agriculture is nature's beginning, and therefore the end (ownership) shall be therein.
7. The physical elements were produced for the cause of humanity, and everything is subservient thereto.
8. Property ownership shall be for the landlord and the king.

III. Wealth concepts:
1. Wealth is the root of all evil.
2. The sum total of man's accumulation is the commonwealth.
3. Happiness is the wealth of the nation.
4. All wealth must come from the land.
5. Inherited wealth is unearned wealth.
6. Wealth must consist of reasonable values based upon labor costs.
7. Wealth consists of goods, wares, and merchandise, and a means of their future production.
8. Wealth of a nation may be determined by the fullness of its "coffers."

IV. Nature concepts:
1. Nature is abundant.
2. Nature is undependable.
3. The action of economy must be natural.
4. No economic principle can be contrary to nature.
5. Natural order is impossible owing to monopoly and competition.
6. The force of nature is shown in price fluctuations.
7. Nature is an aid, not a self-cure, for economic ills.
8. Nature is scarce.

V. Sterility concepts:
1. The ruling class, because they do not labor.
2. The middle class (teacher, surgeon, tanner, etc.).
3. Agriculture.
4. Government (democratic).
5. Money.
6. Peasants and common laborers.
7. Nothing and no one; all are of supreme importance.
8. The physically incapacitated.

KEY

Concept	Philosophers					
	Thomas Aquinas	Thomas Filmer	David Hume	John Locke	François Quesnay	Adam Smith
Value		8	7	1	4	6
Private Property	4	2	7	1	8	1
Wealth	6	8	3	2	4	7
Nature	1	5	8	1	6	1
Sterility	5	6	7	1	2	7

Rule for scoring. Each correctly answered cell counts one point.

12.4 Cause and effect.

Directions. In the first column below are a number of causes which led to different results listed in the second column. In the parenthesis to the right of each result, place the numbers of the causes which contributed to the results.

Cause	Result	No. of Cause
1. Corrupting influence of luxury in Rome.	(a) Fall of Egypt	( ) ( )
2. Decline of small farms.		( )
3. Slave revolts and disorders.		
4. Invasion of enemy (Stone Age men).		
5. Hammurabi's code of laws.	(b) Expansion of commerce of Babylon	( ) ( ) ( ) ( )
6. Invasion of desert tribes.		
7. Religious conflicts within Egyptian Empire.		
8. Use of writing (on clay tablets).		
9. Disappearance of farmer class.	(c) Fall of Assyria	( ) ( ) ( )
10. Shift of Greek commerce eastward to Mediterranean World.		
11. Unable to keep army for defense.		
12. Extortion of Roman tax gatherers.	(d) Decline of Hellenistic culture	( ) ( ) ( ) ( ) ( )
13. Hammurabi's defense of the poor class.		
14. Decline of industry.		
15. Slave raids of Aegean World by pirates.		
16. Unsuccessful wars.		
17. Hittite Wars.		
18. Caravan trade with surrounding country.	(e) Decline of Roman Empire	( ) ( ) ( ) ( )
19. Growth of great estates.		
20. Economic and agricultural decline.		
21. Weakened government in Mediterranean World.		

12.5 Recognition of misstatements in European history.

Directions. Cross out with one straight line the words that make the following statements untrue. The sample is correctly worked.

	KEY
A. Napoleon overcame western Europe, ~~conquered England~~, yet died in exile.	
1. Voltaire, a noted philosopher, born in Russia, helped pave the way for the French Revolution.	1. born in Russia
2. The City of Constantinople in southern Rumania was once the seat of the Eastern Roman Empire.	2. in southern Rumania
3. Columbus is remembered for his skill as a navigator as well as for his discovery of America and a new trade route to India.	3. and a new trade route to India
4. Gustavus Adolphus, last King of Sweden, was a champion of Protestantism.	4. last
5. Garibaldi is known as the father of modern Italy. He drove out the Austrians, united several small states into a nation, and founded a new republic.	5. and founded a new republic

Rules for scoring. Each sentence corrected properly will count one point. Only words in the key marked out must be counted as correct.

13. Spelling.[13]

Directions. Look at the sample:

A. The boys played ( ) in the yard.   1 bol   2 bal
   3 bool   4 ball   5 baul   (4)

The word "ball," which has 4 in front of it, is spelled correctly, and if placed in the space in the sentence would make the sentence correct. So *4* is placed in the margin at the right. Do the rest in the same way. Select the correct spelling and put the number in the margin to the right. Begin.

---

[13] This form was suggested by Pintner, R., Rinsland, Henry D., and Zubin, J. R., "The Evaluation of Self-Administering Spelling Tests," *Journal of Educational Psychology*, Vol. 20 (February, 1929), pp. 107–111, and was found sufficiently valid to use as a substitute for the usual oral recall method (dictation).

1. The boy can (   ).   1 rin   2 rune   3 ren   4
   rum   5 run   (   ) 1
2. The (   ) will spin.   1 top   2 tog   3 tup   4
   topp   5 tep   (   ) 2
3. My apple is (   ).   1 rad   2 red   3 reed   4
   rood   5 read   (   ) 3
4. I lost   my (   ).   1 bok   2 buck   3 buk   4
   book   5 boock   (   ) 4
5. The (   ) is rough.   1 sie   2 sea   3 see   4 sae
   5 se   (   ) 5
6. I will (   ) with you.   1 play   2 pley   3 plai   4
   ply   5 pla   (   ) 6
7. He (   ) the horses.   1 lud   2 led   3 lead   4
   laed   5 leed   (   ) 7
8. These books are (   ).   1 alike   2 alik   3 alick
   4 alek   5 alyke   (   ) 8

Note. Spelling may also be tested without the use of the
sentence by simply giving one correctly spelled word mixed
with several incorrectly spelled words, or one incorrectly
spelled word mixed with several correctly spelled words.   Sam-
ples of the two forms are:

1. (   )   1 coming   2 yello   3 moove   4 parck   5
   factry
2. (   )   1 different   2 important   3 average   4 com-
   plete   5 arond

14. Stagecraft. *Knowledge of parts of stage.*

Directions. Below is given the diagram of a stage and its parts.
Each part is given a letter.   In the column below are listed the stage
parts.   Find the letter on the diagram that is on the part named, and
place the letter in the parenthesis before that part.   The sample, *A*,
curtain line, is the line *A* on the drawing.
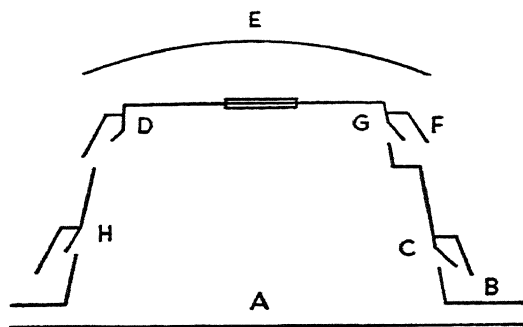
KEY	*A.* (*A*) curtain line
1. (E)	1. ( ) cyclorama
2. (D)	2. ( ) upstage right entrance
3. (B)	3. ( ) tormentor
∴ (F)	4. ( ) backing
5. (C)	5. ( ) downstage left entrance

Rule for scoring. Count each correct response one point.

Selected List of Books Containing Samples of Objective Tests and Suggestions for Their Construction

Bursch, James Frederick, and Meltzer, H., *The New Examination: Its Construction and Use*, Los Angeles, Southern California School Depository, Ltd., 1931.

Cook, C. G., *New Type Questions in Chemistry*, New York, Globe Book Company, 1927.

Green, Charles E., *New Type Tests, Research Monograph Number Three*, Denver, Denver Schools Press, 1926.

Greene, Harry A., and Jorgenson, Albert N., *The Use and Interpretation of Educational Tests*, New York, Longmans, Green and Company, 1929, Chap. V, pp. 89–116.

——, *The Use and Interpretation of Elementary School Tests*, New York, Longmans, Green and Company, 1935, Chap. IV, pp. 59–90.

——, *The Use and Interpretation of High School Tests*, New York, Longmans, Green and Company, 1936, Chap. IV, pp. 58–89.

Hawkes, Herbert E., Lindquist, E. F., and Mann, C. R., *The Construction and Use of Achievement Examinations*, Boston, Houghton Mifflin Company, 1936, Part II, pp. 163–442.

Hopkins, L. T. (ed.), *The Construction and Use of Objective Examinations*, Boulder, Colo., University of Colorado, 1926.

Lang, Albert R., *Modern Methods in Written Examinations*, Boston, Houghton Mifflin Company, 1930, Chaps. V, VI, and VII, pp. 84–158.

Lee, J. Murray, *A Guide to Measurement in Secondary Schools*, New York, D. Appleton-Century Company, 1936, Chap. VII, pp. 226–265.

Lincoln, Edward A., and Workman, Linwood L., *Testing and the Uses of Test Results*, New York, The Macmillan Company, 1935, Chap. XI, pp. 182–205.

Michell, Elene, *Teaching Values in New-Type History Tests*, Yonkers-on-Hudson, N.Y., World Book Company, 1930, Chap. VI, pp. 93–120.

Newkirk, Louis V., and Greene, Harry A., *Tests and Measurements in Industrial Education*, New York, John Wiley and Sons, Inc., 1935, Chap. XI, pp. 131–149.

Odell, C. W., *Educational Measurement in High School*, New York, D. Appleton-Century Company, 1930, Chap. XX, pp. 471–499.

Orleans, Jacob S., and Sealy, Glenn A., *Objective Tests*, Yonkers-on-Hudson, N.Y., World Book Company, 1928, Chap. XIII, pp. 218–242.

Paterson, Donald G., *Preparation and Use of New-Type Examinations*, Yonkers-on-Hudson, N.Y., World Book Company, 1925.

Rollinson, Ethel A., *Diagnostic Testing and Remedial Teaching of Gregg Shorthand*, New York, Gregg Publishing Company, 1931.

Ruch, G. M., *The Improvement of the Written Examination*, Chicago, Scott, Foresman and Company, 1924, Chap. IV, pp. 65–105.

——, *The Objective or New-Type Examination*, Chicago, Scott, Foresman and Company, 1929, Part II, Chaps. VII, VIII, IX, and X, pp. 149–280.

Ruch, G. M., and Rice, G. A., *Specimen Objective Examinations*, Chicago, Scott, Foresman and Company, 1930.

Ruch, G. M., and Stoddard, George D., *Tests and Measurements in High School Instruction*, Yonkers-on-Hudson, N.Y., World Book Company, 1927, Chap. XV, pp. 266–281.

Russell, Charles, *Classroom Tests*, Boston, Ginn and Company, 1926, Chaps. III-VII, pp. 28–165.

Segel, David, *Elementary School Graduating Examinations*, Washington, D.C., United States Government Printing Office, 1935, Chap. III, pp. 34–41, 52–56.

Smith, Henry Lester, and Wright, Wendell William, *Tests and Measurements*, Newark, Silver, Burdett Company, 1928, Chap. XXII, pp. 511–539.

Symonds, Percival M., *Measurements in Secondary Education*, New York, The Macmillan Company, 1927, Chap. III, pp. 24–52.

Tiegs, Ernest W., *Tests and Measurements for Teachers*, Boston, Houghton Mifflin Company, 1931, Chap. IV, pp. 57–78, Chap. XIII, pp. 243–253.

Tyler, Ralph W., *Constructing Achievement Tests*, Columbus, O., Bureau of Educational Research, Ohio State University, 1934.

University of Chicago Board of Examiners, *Manual of Examination Methods*, by Richardson, M. W., Russell, J. T., Stalnaker, J. M., and Thurstone, L. L., University of Chicago Bookstore, 1933.

Wilson, Guy M., and Hoke, Kremer J., *How to Measure*, New York, The Macmillan Company, 1928, Chap. XXIV, pp. 522–526.

Wood, Ben D., *Measurement in Higher Education*, Yonkers-on-Hudson, N.Y., World Book Company, 1923, Chaps. IX-XII, pp. 215–273.

The Improvement of Marks and Grading Systems

Evidence has been submitted in Chapter I which points out the inaccuracies in teachers' marks and the present system of marking or grading. Objective tests will reduce these inaccuracies to a minimum, but objective tests yield point scores and not grades. For the purpose of consideration and improvement, *grades* will be defined as interpreted scores of individuals which are based upon the achievement of the group. A point score does not mean anything unless it is interpreted in terms of the group. To say that a student has made 114 points on a test does not tell anything about his achievement, because the achievement of an individual has meaning only when it is compared with the achievement of the group. A man is tall or short in the proportion that he is taller or shorter than other men, usually than the average. One who is neither short nor tall has the height of the average because that is his relative position in the group. A point score or a score on an accurate measuring instrument without any interpretations or references to the group should be called a *raw score*, although some writers call this an *absolute score*. A grade or mark is really relative and has only a relative meaning. It should describe the position of the individual in his group. If objective tests alone are used for grading, the problem of converting objective test scores into grades must still be solved.

While the evidence presented in Chapter I raised serious questions as to the reliability of subjective examinations, it must not be denied that subjective examinations do measure something, and that this something is vitally important in the building of a semester, or term, grade. Furthermore, many educational products cannot be measured objectively because of their very nature. They are not objective but subjective. Such results are style and thought value in writing, quality of handwriting, organization of subject matter in term papers, and all products which cannot be reduced to simple, objective,

measurable units and must be measured by opinion or subjectively. A valid grading system, that is, a grading system which accurately measures what it purports to measure, must measure all phases of learning and achievement; and since some of these phases are qualitative and not quantitative, subjective or essay examinations must be used. What they measure is important. What is needed is an accurate way of grading or rating subjective or essay examinations.

Three problems therefore are obvious: First, a grading system which measures all learned units of achievement must be organized or set up. These measurements must be accurate, mathematically true, psychologically sound, and administratively feasible. Second, some method must be designed to add the value of essay or subjective examinations to the point scores on objective tests. Third, some method must be designed to convert point scores into grades in the adopted grading system.

Considerable discontent with the grading system has been expressed by parents, teachers, and writers. Odell,[1] in a survey of 281 Illinois high schools, found nearly one hundred different grading systems. Motsenbacker[2] found approximately the same number in Oklahoma. Gould,[3] in a questionnaire study received from 93 secondary schools in 47 states, found little uniformity in the standards by means of which the progress of pupils is measured. Sixty-three per cent of the schools employed a percentage or so-called "absolute" system, and 37 per cent employed a relative ranking plan. In 59 schools, 20 had a passing mark of 75 per cent, 31 a passing mark of 70 per cent, 3 a passing mark of 65 per cent, and 5 a passing mark of 60 per cent. Warden[4] states the view of superintendents that the present system of marking is grossly inaccurate and unfair. Rogers[5] condemns the traditional report card as unscientific, misleading, and undesirable, and suggests that specific marks be gradually diminished and those marks be given on objective

[1] Odell, C. W., "High School Marking Systems," *School Review*, Vol. XXXIII, 1925, pp. 346–354.

[2] Motsenbacker, John D., *High School Marks and Marking Systems of Oklahoma*, unpublished master's thesis, University of Oklahoma, 1933.

[3] Gould, George, "Practices in Marking an Examination," *The School Review*, Vol. XL (February, 1932), pp. 142–146.

[4] Warden, K. W., "Turning the Light on Teachers' Marks," *American School Board Journal*, Vol. LXIX (October, 1924), p. 64.

[5] Rogers, Frederick Rand, "The Case for the Elimination of the Traditional Report Card," *Education* (December, 1933), pp. 234–239.

tests only.   In 1933 the Newton Public Schools[6] abolished grade cards and replaced them by some private note to parents discussing the child (obviously a subjective discussion—the teacher's personal opinion).   The lack of uniformity of what teachers believe should be considered in grading is shown by Hughes,[7] who describes 30 factors that teachers take into account in giving the semester mark.   These vary in importance from the accuracy of work accomplished, through ability to study independently, industry and effort, attention to class discussion, originality, initiative in finding materials, making up work voluntarily, and interest in work, to group placement.   Messenger and Watts[8] present an annotated bibliography about marking systems and report cards from 83 articles in educational periodicals covering the years 1917 to 1934.   These articles reveal many cases of differences in grading systems, lack of faith in grading systems, and discontentment with grade cards and with the grades used on such report cards.

The greatest single factor contributing to all these disagreements and dissatisfactions about marking systems can be traced to the fundamental fact that few grading systems are reliable and valid.   They are seldom based on sane mathematical assumptions, a comprehensive knowledge of psychology and measurements, and a practical use of grades.   Wakeman[9] has pointed out that grades should be fair, impartial, impersonal, uniform, and entirely comprehensible to the students *and parents* (italics are the writer's).   The first four of these are mere matters of reliability, while the fifth item is a matter of simplicity.   It should be added that a grade should be a pure measure of what it purports to measure, and that it should comprehensively measure the things for which the grade stands. If it is a semester grade, it should report a very complete, valid, and accurate measure of everything learned; if it is a grade in arithmetic, it should measure the learning in arithmetic and arithmetic only.   This is what is meant by *purity* or *validity* of a

[6] "News of the School World": "Report Cards Abandoned by Newton Public Schools," *Journal of Education* (November, 1933).

[7] Hughes, W. H., in *California Quarterly*, Vol. VIII (January, 1933), pp. 202–203.

[8] Messenger, Helen R., and Watts, Winifred, "Summaries of Selected Articles on School Report Cards," *Educational Administration and Supervision*, Vol. XXI (October, 1935), pp. 539–550.

[9] Wakeman, G., "Humanizing Grades," *School and Society*, Vol. XXXIV (October, 1931), pp. 596–598.

grade. The writer believes that once these factors can be demonstrated in the grading system, grading and reporting grades will take on an entirely different nature and meaning to teachers, pupils, and parents. Perhaps a very highly accurate and technical grading system should be used by the school for clinical diagnosis and treatment. This would be similar to hospital records, which are often highly technical. A simple grading plan which is administratively feasible and comprehensible to parents may also be used.

Many schools which claim that they have abolished grading and only pass or fail pupils have only fooled themselves, because this is grading pupils into two classes. One large city school system published a report that it had abolished grading in the high school and was only passing or failing students. A sequel to this was a newspaper story published a year later that the high school authorities were unable to choose a valedictorian or salutatorian. Obviously, the article might have stated that the authorities knew so little about their students that they could not say who had learned what and who was or was not capable of entering college after being graduated from the high school. Such ignorance is the mark of neither scientific progress nor humanitarian treatment. Without grades, all efforts of educational and vocational guidance are eliminated and guesswork substituted in their place. Smith[10] points out the fallacy of the old marking system and suggests its replacement by professional diagnostic records used confidentially. Many other writers have taken the same viewpoint. Grades are needed, but they must be valid, dependable, and useful.

In view of these facts, two types of grades will be presented— a clinical grade and a practical grade. The clinical grade will be highly accurate and technical and of the nature of a diagnostic, clinical, and confidential record of children's school achievement. The practical grade will be less accurate, more practical, simpler to understand, and such that it may be given to parents and children as a description of achievement and progress. The two grading systems will be derived from the clinical system. The treatment here, however, will be in the reverse order for the sake of simplicity in learning the statistics involved. The practical grading system to be given as reports to pupils and parents will be described first. Philosophical and scientific

---

[10] Smith, E. R., "Marks and Marking," *Child Welfare*, Vol. XXVII (October, 1932), pp. 73–75.

principles which should control any grading system must be investigated first, as these are equally effective for both a clinical grade and a practical grade.

I. Logical and Scientific Principles Known about Marking Systems

1. A grade or school mark is whatever it is defined to be. This should be apparent to the reader. What is A to one teacher is not A to another. What is passing to one teacher is failing to another. This is true not only in schoolwork, but in every avenue of life. There is no simple measure of success or failure in any walk of life. Sometimes one is content to believe that a person is a success if he is called successful by others who are successful and who themselves say they are successful. Since it has been shown that teachers cannot agree on what is a failure mark or what is any percentage, the first logical step in setting up a grading system is simply to admit that a grade or a mark is whatever it is defined to be. Definite interpretations and definitions are necessary, but English words, even the most descriptive and choicest of adjectives, are not sufficiently accurate for scientific measurements. They are not used in the measurement of heat, they are not used in the measurement of the number of red corpuscles in the blood, and they are not used in the measurement of the strength of steel. The educator must of necessity demand numerical definitions based on reliable and valid measurements.

2. The grading system must be valid as well as accurate. This means that it must be a pure measure of the thing we intend to measure. The author found that in measuring arithmetic and English usage teachers consider many subjective factors, and that most of these are not achievements in the subject. It is obvious that none of their grades will be a valid or a pure measurement. When achievement alone is considered, regardless of the attitude, the character, or the personality of the student, then we can get a valid measure of achievement. These other factors must be measured, but they must be measured separately and with the same degree of validity and purity. If nothing but subject-matter achievement is considered in subject-matter grades, then it will be possible to measure these factors with a very high degree of validity. Attitude toward subject matter or conduct in the room where subject matter is taught should be graded sepa-

rately. It is altogether possible that a student who is high in subject-matter achievement may be low or average in personality, in conduct, or even in character. Therefore, the separation of achievement from other factors or traits is the first essential of a valid grading system.

The second requirement for validity is comprehensiveness, and this demands that both objective and subjective measures be used. Every phase of achievement must be measured as accurately as possible. This would include reports on outside readings, term or unit reports and papers, regular subjective examinations, and perhaps oral recitations accurately rated, as will later be explained. All measures must be considered from the standpoints of validity and reliability, but validity is the first and most important factor.

3. Number of divisions to a grading system. The number of subdivisions of a whole range of marks has a great deal to do with a grading system. Other things being equal, a large number of subdivisions is more desirable than a small number of subdivisions; but the larger the number of subdivisions, the more accurate should be the measuring instrument. A foot divided into one-hundredths of an inch is more accurate than one divided into sixteenths of an inch; but one one-hundredth of an inch is such a fine subdivision that it is almost impossible to see it with the human eye. Seven subdivisions of a grading scale are probably more desirable than five; but many investigations have thrown doubt on the reliability of seven subdivisions of grading, especially when quality and subjective judgment are concerned. While the evidence will not be presented here, there is a clear indication that five subdivisions to a grading system covering the work in one grade or one class are as many divisions as can be accurately used where personal judgment is concerned. Teachers, under certain rules, can accurately judge five degrees of ability or quality. The writer[11] found that teachers could more accurately judge five degrees of handwriting than seven degrees, and for this reason the handwriting scales which he constructed have five degrees of quality for each school grade.

From a practical standpoint, five are more desirable than seven. If a distribution approximates the normal curve, and the grading system has seven subdivisions, only .5 of one per

[11] Rinsland, Henry D., The Practical Handwriting Scales, Teacher's Manual, The Practical Drawing Company, Dallas, Texas, 1930.

cent of the number of cases make the highest grade and the lowest grade, say, the grades of A and F. In order to have one child make a grade of A or one child make a grade of F, it is necessary to have at least 200 cases (.5 per cent of 200 is 1). Five subdivisions are very practical in public schools and are enough subdivisions for parents and children to have a fairly accurate picture of the position of a child in his group. Therefore, five subdivisions will make a practical division of the whole range of ability within the range of one school grade.
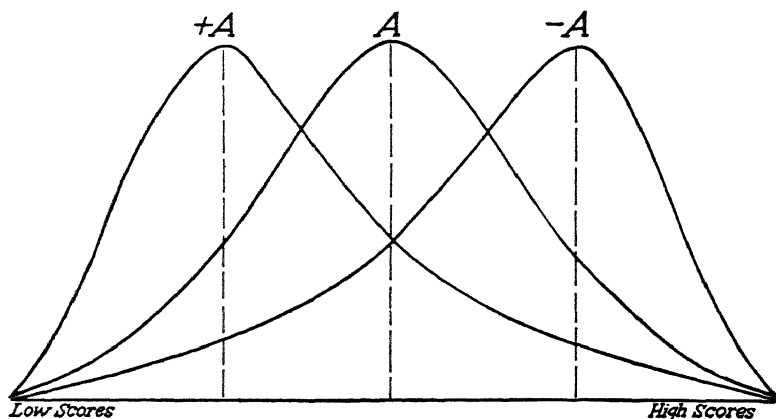
Fig. 1. Curve A represents normal distribution with the same range and number of cases on both sides of the middle line. Curve $+A$ is a positively skewed curve. Curve $-A$ is a negatively skewed curve.

4. Assumptions based on the normal curve. For practical use in grading, the normal curve of distribution of any set of scores is one which has many cases at or near the middle, fewer cases away from the middle, and the number of cases smaller and smaller as the ends are approached. The number of cases on both sides of the exact middle should be the same. A skewed curve is one in which the distribution is lopsided: that is, the frequencies are greatest not at the middle, but at one end or the other. Figure 1 shows a normal curve and two skewed curves. There are exact mathematical formulas for all these curves.

Hundreds of distributions of scores on standardized and objective tests have been published within the last twenty years. An examination of these will show that reliable and valid tests, designed for the groups measured, yield close approximations to the normal probability curve. These data also show that

the curves are seldom greatly skewed; that is, approximation to the normal curve is the usual form of distribution. A principle may be deduced from these measurements: If the true distribution is not known, it is likely that normal distribution will be nearer the actual fact than no assumption of distribution or an assumed skewed distribution. Therefore, it is almost always safer to assume normal distribution than anything else. Uncontrolled personal or subjective judgment has been shown to be about the most inaccurate or unscientific assumption. It will be shown later that perfectly normal distribution is not to be rigidly followed, but rather the actual curve of good objective tests. This is especially true in the case of few subjects or the number that actually occurs in a class, say, from 25 to 50.

Most well-standardized tests give normal distributions for the range of abilities they are designed to test. Tests which possess this property of measuring differences where differences exist are said to have the power of discrimination; that is, they discriminate abilities that actually exist. Monroe,[12] in speaking of the criterion of discrimination, says, "This index of validity refers to the differentiation of scores for pupils possessing different degrees of ability. It is obvious that any lack of objectivity or reliability will result in a lack of discrimination for certain pupils." Rinsland,[13] speaking of an approximately normal distribution of scores which are widely distributed, says, "This is an index of both validity and sampling. It shows that the difficulty of the test items is well distributed, that the range of abilities of the subjects tested is well distributed, and that their abilities are differentiated by appreciable differences in total scores." Thorndike[14] shows that the form of distribution of a number of intelligence tests is approximately normal, excepting the case of special groups. Tests which possess the property of measuring actual differences that exist will come nearer being approximately normal distributions than skewed distributions. Such writers as Ellis[15] recommend the use of a comprehensive

[12] Monroe, Walter S., *An Introduction to the Theory of Educational Measurements*, Boston, Houghton Mifflin Company, 1923, p. 219.

[13] Rinsland, Martha O'D., *A Test for Measuring Teachers' Knowledge of the Conduct and Personality of Children From Six to Eight Years of Age*, unpublished doctor's dissertation, Norman, Okla., University of Oklahoma, 1936, p. 36.

[14] Thorndike, Edward L., *Measuring of Intelligence*, New York City, Bureau of Publications, Teachers College, Columbia University, 1926.

[15] Ellis, Robert S., *Standardizing Teachers' Examinations*, Bloomington, Ill., Public School Publishing Co., 1927.

intelligence test to determine the form of distribution if it is not normal.

The final test of the use of this assumption of the normal distribution by the classroom teacher will come as an actual analysis of scores on tests she builds. When the rules of building good objective tests are followed and subject matter is well sampled, it is the opinion of the writer, from his years of experience in test construction, that the teacher will find that the scores on her better tests will closely follow normal distribution.

Once admitting normal distribution as the most probable form of the distribution of the scores, five subdivisions of the whole range of abilities may be calculated and the percentage of cases falling within each subdivision can be determined. When calculated by calculus, the percentages of cases for the five subdivisions are: 6, 22, 44, 22, and 6. These divisions may be called marks or grades, and any notation may be assigned, as: A, B, C, D, F; 1, 2, 3, 4, 5; or Excellent, Fair, Average, Poor, Very Poor (or Unsatisfactory). The use of the normal curve does not define the lowest group as failures. Five degrees of ability or achievement are practical and are used in many of the practical grading situations in life outside of school. Seven degrees are impractical. If seven subdivisions were employed, there would be one pupil with an A and one pupil with an F for each group of 200 pupils. Since grades are given in classes of 30 to 50 pupils, seven subdivisions would be impractical. Normal distribution also demands an odd number of divisions in order to have the curve highest in the middle. Therefore, four or six divisions are impractical. Five divisions are practical, scientific, and sufficiently accurate for a grade to be given to parents and pupils.

5. Meaning and use of failure division. What a school does to the lowest group is a matter of policy. Failure, then, is a policy of an institution rather than a point measured scientifically. It depends more on the philosophy of education than on the science of education. In many elementary schools, no children who attend regularly are failed. The lowest group may need diagnosis and remedial teaching. It seems inhumane to make these pupils go over the same work another year or semester. Often, by careful diagnostic tests, the teacher can find the trouble; then, if she knows how to teach, she can adapt these elements to the pupil's ability so that he can learn them

in a few weeks. Gates and Bond[16] have taken many failures in reading and taught them to read in a recently established reading clinic and laboratory in the schools of New York City. Educational literature is full of recorded remedies of apparent failure. A recent issue of the *Yearbook of the National Society for the Study of Education*[17] has many suggestions for diagnosing and teaching failures. Baker[18] has given a detailed description of many cases of diagnostic and remedial treatment of maladjusted children. The measurement of failure in teaching is as important as the measurement of failure in learning. The responsibility for teaching rests on the school. If a child does not learn, it is the school's responsibility to find out why; but the school must employ the best measurements that educational science can produce to determine the degrees of learning, disability, and handicaps. More and more the failure of pupils by teachers is being looked upon, by people who know, as inefficient teaching or wrong curricular placement of subject matter. Since the failure line is a matter of policy, and failure is in bad repute, the lowest group should not be regularly branded as *failure;* some other term should be employed. It should simply be classed as the lowest 6 per cent, or *E.* What the schools should do with this group is not in the province of this book. Our responsibility here is to measure accurately all ranges of achievement; then treatment and guidance can follow.

II. Plans for Converting Scores into Grades for a Practical Grading System

Now, if we admit that a grade is what we define it, and we see that normal distribution is likely to be more nearly scientific (accurate) than any other distribution, we can find several ways of converting, or transmuting, test scores into marks or grades. Obviously, then, we must define *scores* as correct or incorrect

---

[16] Gates, Arthur I., and Bond, Guy L., "Reading Disabilities," *Journal of the National Education Association* (November, 1936), pp. 243–244; "Prevention of Disabilities in Reading," *Journal of the National Education Association* (December, 1936), pp. 289–290; and Gates, Arthur I., "Failure in Reading and Social Maladjustment," *Journal of the National Education Association* (October, 1936), pp. 205–206.

[17] National Society for the Study of Education, "Educational Diagnosis," *Thirty-Fourth Yearbook*, Bloomington, Ill., Public School Publishing Company, 1935.

[18] Baker, Harry J., *Educational Disability and Case Studies in Remedial Teaching.* Bloomington, Ill., Public School Publishing Company, 1929.

points in examinations, and *grades* or *marks* as the opinion of teachers about examination values, or the comparison of one pupil's score with the scores of the whole group. A *grade* is an interpreted score. Two plans for transmuting test scores into grades will be given. One involves a percentage distribution of the pupils only. The other first defines a certain middle range of scores, and then defines groups of scores above and below the middle group.

1. Normal percentage plan. The highest 6 per cent of students are defined as *A* (or whatever the highest group is called); the next 22 per cent are defined as *B*; the next 44 per cent are defined as *C*; the next 22 per cent are defined as *D*; and the next 6 per cent, or lowest group, are defined as *E*. These exact percentages will not always work out in exact whole numbers, for the number of students is a discrete number and admits of no fractions. Therefore, use the nearest whole number. When considering the grades of *D* and *B* (those just below and above the middle grades), always make the extra fraction add to the size of the middle group. This is generally a little more accurate than any other procedure, for in small groups the middle group usually has fewer cases than normal.

Illustrations of percentage distribution. The scores in Table I were obtained on an objective test in a classroom with 46 pupils. The number of pupils making each score is also shown. The calculations and the number of pupils making each letter grade are given. (For comparison, the other plan, or sigma plan, to be discussed later, for the same scores, is also shown in Table I.)

It will be noticed from Table I that the scores are in step intervals of 1; that is, from one score to the next is a step of one point. The original data from the test are recorded in the two columns headed *Score* (X) and *No. of Pupils* (f). These symbols are usually used by statisticians. In calculating grades by the percentage plan, the total number of cases (in Table I, 46) is multiplied, respectively, by 6, 22, 44, 22, and 6 per cent, and the nearest whole numbers are taken for the respective grades. It will be further noticed that if these whole numbers do not include all pupils for a given score, fewer or more pupils than the percentage calculated must be taken, for all pupils making the *same score* must be assigned the *same grade*.

2. Sigma (or standard deviation) plan. This plan assigns a certain range of scores to the middle group first, then this range is assigned to the grades of *D* and *B* (those just below and

TABLE I

ORIGINAL SCORE AND FREQUENCY FROM AN OBJECTIVE TEST, AND CALCULATION OF LETTER GRADES A, B, C, D, AND E BY THE NORMAL PERCENTAGE PLAN AND SIGMA PLAN

Data from Test		Normal Percentage Plan			Sigma Plan					
Score X	No. of Pupils f	Range of Scores	No. of Pupils	Letter Grade	fX	d	fd²	Range of Scores	No. of Pupils	Letter Grade
17	1	15-17	3	A	17	8	64	16-17	2	A
16	1				16	7	49			
15	1				15	6	36			
14	2	12-14	8	B	28	5	50	12-15	9	B
13	3				39	4	48			
12	3				36	3	27			
11	4	7-11	25	C	44	2	16	7-11	25	C
10	5				50	1	5			
9	7				63	0	0			
8	5				40	−1	5			
7	4				28	−2	16			
6	3	3-6	7	D	18	−3	27	3-6	7	D
5	2				10	−4	32			
4						−5				
3	2				6	−6	72			
2	2	1-2	3	E	4	−7	98	1-2	3	E
1	1				1	−8	64			
	N = 46		46		ΣfX = 415		Σfd² = 609		46	

Calculation of range of scores for letter grades by the normal percentage plan:

46 × 6% = 2.7, or 3 cases for A.
46 × 22% = 10.2, or 8 cases for B.
46 × 44% = 20.2, or 25 cases for C.
46 × 22% = 10.2, or 7 cases for D.
46 × 6% = 2.7, or 3 cases for E.

Calculation of mean, M:

$$M = \frac{\Sigma fX}{N}$$

$$= \frac{415}{46} = 9.02.$$

M = 9, approximately.

Calculation of sigma:

$$\sigma = \sqrt{\frac{\Sigma fd^2}{N}}$$

$$= \sqrt{\frac{609}{46}} = \sqrt{13.23} = 3.6.$$

$$\tfrac{1}{2}\sigma = 1.8, \text{ or } 2.$$

Calculation of range of scores for letter grades by sigma plan:

Grade C is ±½σ from mean = 2 + 9 and 2 − 9 = 7 to 11.
Grade B from upper end of C (11) to 1σ higher (11 + 4), or range from 12 to 15.
Grade D from lower end of C (7) to 1σ lower (7 − 4), or range of D from 3 to 6.
Grade A ranges from upper limit of B to end of scale, or range of A from 16 to end of scores.
Grade E ranges from lower limit of D to end of scale, or range of E from 2 to end of scores.

above the middle grade), all the other scores below those given
D are assigned a grade of E, and all the scores above those given
B are assigned a grade of A.   This plan does not follow the
normal curve so closely as the normal percentage plan, but it
follows the actual distribution of scores.   It is necessary to
calculate the mean and the standard deviation (represented by
the small Greek letter, σ), often called *sigma*.   Sigma is a unit
of measure on the base line of a distribution or frequency poly-
gon.   One sigma sets off, above and below the mean, in a normal
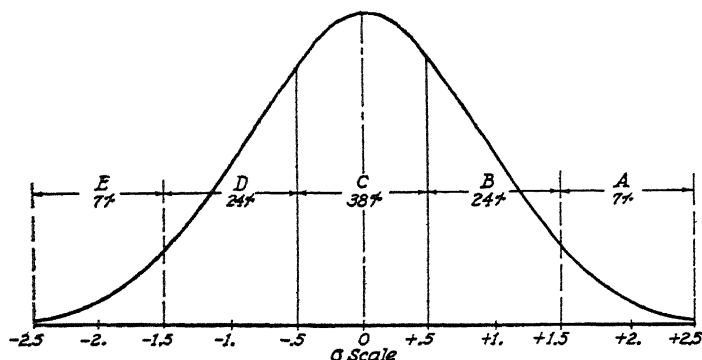
Fig. 2.   Normal Curve with the Base Line Divided into Five Equal Divisions, Each
One σ Wide.

distribution, the middle 68.26 per cent of all the cases, or 34.13
per cent on each side of the mean.   One half-sigma, on each
side of the mean, sets off 38.3 per cent.   Since a grade is what
it is defined, each letter grade can be defined as a range of scores
one sigma wide.

When the standard deviation is drawn on a normal curve, it
brings out these facts much more clearly.   This is shown in
Figure 2.   The vertical full lines divide the curve into whole
sigmas, while the vertical dotted lines divide the curve into
half-sigmas.   One half-sigma above and one half-sigma below
the mean set off 19.15 per cent on each side of the mean.
Between plus and minus one-half sigma is 38.3 per cent of all
cases.   One sigma on each side of the mean will set off 34.13 per
cent, or the distance from minus one sigma to plus one sigma
will set off 68.26 per cent of all cases.   Sigma, as a unit of meas-
ure, is a long unit because the distance from minus one sigma
to plus one sigma includes over two-thirds of all cases in the
distribution.

Calculation of grades by sigma plan when scores are ungrouped.
The mean is first calculated.   The formula for the mean is:

$$M = \frac{\Sigma fX}{N},$$

where ΣfX is the sum of the frequency times the score and N is the number of cases.   The Greek letter Σ stands for the word *summate*, meaning *to add*.   Multiply each score by its frequency $(X \times f)$, sum these products (ΣfX), and divide by the number of cases (N).   Since the scores are in whole numbers, all grades must be based on whole numbers; therefore, the mean is a whole number.   Table I shows the calculation of the mean.   The mean is 9.   The mean as calculated by the above formula is just the same as the average that is taught in arithmetic and involves no additional mathematics.

The standard deviation, or sigma (σ), is also a mean.   The numbers that are added and later divided by the number of cases are not the scores, but the square of the deviations of the scores from the mean.   The deviations (d) are first squared (d^2), multiplied by the frequency (f), added (Σfd^2), and divided by the number of cases $\left(\frac{\Sigma fd^2}{N}\right)$.   This gives a mean of deviations squared, but to use this mean it must be in terms of the original scores which are not squared.   Therefore, the average of the deviations squared must be "unsquared," or, as mathematicians would say, the square root must be extracted.

The formula for the standard deviation is:

$$\sigma = \sqrt{\frac{\Sigma fd^2}{N}},$$

where (d^2) is the square of the deviation $(d = X - M)$ of each score from the mean.

Table I also shows the calculation of the sigma.   The highest score, 17, deviates from 9, the mean, 8 points; therefore, 8 is entered in the d column; 8 squared is 64, and 64 multiplied by 1, the frequency, is 64.   Place 64 in the fd^2 column.   Sum the fd^2 column, and place this sum in the formula for the Σfd^2.   Divide by the number of cases and extract the square root.   In the problem this is 3.6; but since all scores are whole numbers, and not fractions, we must take the nearest whole number, or 4.

Definition of letter grades, **A, B, C, D,** *and* **E.**   In defining a

letter grade by any plan, the first letter grade to be defined should be the most reliable and stable. This should be the middle group, which according to the sigma plan will be plus and minus one-half sigma. The middle group of children whose scores will fall within this range is the largest group with 1σ unit range on the base line of the normal curve or frequency polygon. Therefore, from the standpoint of sampling, these scores are the most stable. The scores of this group are also the most reliable scores because on most well-constructed tests these children are best sampled by both easy and hard questions. The children who make low scores are not well sampled in information on easy questions; and, likewise, the children who make high scores are not well sampled on hard questions. The procedure of first defining the grade of the middle group in the sigma plan is far superior to the procedure in the normal percentage plan. Once defining the middle group, or letter grade C, as plus and minus one-half sigma from the mean (one sigma wide), the definition of the B and D groups naturally follows as ranges also one sigma wide (B from $+.5\sigma$ to $+1.5\sigma$; D from $-.5\sigma$ to -1.5σ). A is defined as the group from the upper limit of B, or from $+1.5\sigma$, to the end of the distribution. E is defined as the group from the lower limit of the D group, or from -1.5σ, to the end of the distribution. Definitions of the end groups, A and E, thus provide for extremely high and low scores without seriously affecting the definitions of the other groups. This is desirable, as occasionally extremely low and extremely high scores are found in small groups or single classes. With reliable scores, numerically determined, and a reliable and stable definition of the groups numerically determined, a reliable and stable grading system is established.

The calculation of the range of scores for letter grades in Table I is self-explanatory. Since the scores are whole numbers, but the trait measured is continuous, five scores are in the C group. Theoretically, for a grade of C we should add and subtract 2 from, not 9, but 9.5, the mid-point of that step. The real range of this step is from 9.0 to 9.999+. This would give us scores of 7.5 to 11.5 for a C grade: but all our scores are in whole numbers; therefore, C ranges from 7 to 11.

Calculation of sigma when scores are grouped and the mean is assumed. Another method of calculating both the mean and the sigma is by first guessing the mean and later correcting for the error of the guess. This is often called a "short method,"

but it is short only when there are many cases and the range of scores is very wide.

The formula for the calculation of the mean is:

$$M = M' + \frac{\Sigma f d'}{N},$$

where M' is the assumed mean,
$\quad d'$ is the deviation of a score from the M', $(d' = X - M')$,
$\quad f$ is the frequency,
$\quad N$ is the total number of cases, or sum of the f's,
$\quad \Sigma$ is the sign of adding,
and $\quad M$ is the true mean.

The formula for the calculation of the sigma is:

$$\sigma = \sqrt{\frac{\Sigma f(d')^2}{N} - \left(\frac{\Sigma f d'}{N}\right)^2}.$$

Each step in the calculation of the mean and sigma is given in Table II: first, an extension of the original data from the test is given; and second, from these data the mean and sigma are calculated under the column *Calculated Extension*. The mean is calculated under the columns headed d' and $f d'$, and the sigma is calculated under the column $f(d')^2$, as these columns are used in these calculations. Under the column *Letter Grades and Number of Cases* are the calculations for the range of scores for each letter grade, where the range of the grades of C, B, and D is defined as $\frac{1}{2}\sigma$ wide.

However, a small difference in percentage makes little or no difference in the number of children in small classes. For a difference of 1 per cent to make a difference of one child, it takes 100 pupils in the group $(100 \times 1\% = 1)$. If the dividing line between two letter grades comes at a score that has more than the frequency for that grade, this will keep the exact number of cases for that grade from being assigned. For example, if we need 2 cases of a certain score to make the even number for a grade of B, and there are 5 cases making this score, we certainly must give all 5 cases the same grade. Such matters must always be considered in making grades. Any grade is less accurate than the original score, as it is a score of an arbitrarily defined group. No grade can ever be more accurate than the original or raw score.

The two plans for grading discussed might be called *practical* grading plans. The letter grades can be given to pupils and

Table II
ORIGINAL SCORE AND FREQUENCY ON AN OBJECTIVE TEST, AND
CALCULATION OF THE MEAN, SIGMA, AND LETTER GRADES
OF A, B, C, D, AND E

Data Given from Test				Calculated Extension	
X	f	d'	fd'	$f(d')^2$	Letter Grades and No. of Cases
42–43	1	18	18	324	A
40–41		16			
38–39	1	14	14	196	2 pupils
36–37		12			
34–35	2	10	20	200	B
32–33	1	8	8	64	
30–31	1	6	6	36	4 pupils
28–29	1	4	4	16	
26–27	1	2	2	4	C
24–25	4	0	0	0	
22–23	1	− 2	− 2	4	
20–21	3	− 4	−12	48	10 pupils
18–19	2	− 6	−12	72	
16–17	2	− 8	−16	128	D
14–15	1	−10	−10	100	
12–13		−12			5 pupils
10–11		−14			E
8–9	1	−16	−16	256	
6–7	1	−18	−18	324	2 pupils

$N = 23$
$\Sigma + fd' = +72$
$\Sigma - fd' = -86$
$\overline{\Sigma fd' = -14}$

$\Sigma f(d')^2 = 1{,}772$

Calculation of mean:

$$M = M' + \frac{\Sigma fd'}{N}$$
$$= 25 - \frac{14}{23}$$
$$= 25 - .609$$
$$= 24.4$$
$$= 24,\ \text{approximately or in whole numbers.}$$

Calculation of σ:

$$\sigma = \sqrt{\frac{\Sigma f(d')^2}{N} - \left(\frac{\Sigma fd'}{N}\right)^2}$$
$$= \sqrt{\frac{1772}{23} - (-.609)^2}$$
$$= \sqrt{77. - .37}$$
$$= \sqrt{76.63}$$
$$\sigma = 8.75$$
$$.5\sigma = 4.37$$
$$= 4,\ \text{approximately or in whole numbers.}$$

Calculation of letter grades:

Grade C: $M \pm .5\ \sigma$; 24 ± 4 and 20 to 28; To include all cases in the step 28–29, include the score 29; therefore, the range is 20 to 29.

Grade B is from 28 to $28 + 8$ or 28 to 36. To include all cases in the step 36–37, include the score 37; therefore, the range is 28 to 37.

Grade D is from 20 to $20 - 8$ or 20 to 12.

Grade A is from 38 to end of distribution.

Grade E is from 12 to end of distribution.

parents. The percentage plan can be easily explained. The sigma plan might be explained by stating that the grade of *C* is the 38 per cent around the average, or middle; the *B* and *D* grades are the next 24 per cent; and the *A* and *E* are the remaining cases above and below these grades. A practical grading plan is one that is practical for parents and pupils; but teachers, who are supposed to have technical training and to be experts in education, may use a more technical and highly accurate plan of grading.
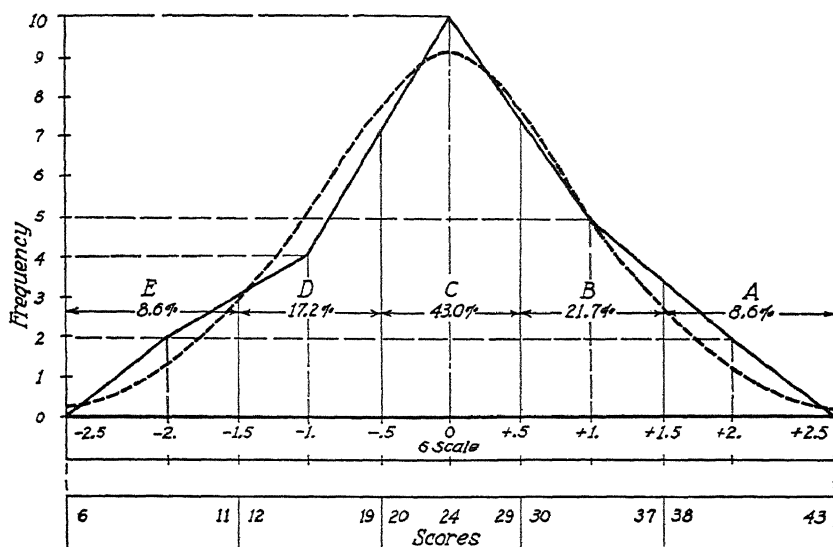
Fig. 3. The Range of Scores for Each One σ Assigned to Letter Grades *A*, *B*, *C*, *D*, and *E* and the Percentage of Cases Making Each Letter Grade. All data are from Table II.

Under the column *Letter Grades and Number of Cases*, the middle grade, or *C*, is defined as 1 sigma wide, or .5 sigma on each side of the mean. Therefore, 4 (.5σ) is subtracted from 24, the mean, and then added to 24. This gives a range in the grade of *C* from 20 to 29. The range of scores for letter grades of *B* and *D* is also 1 sigma wide. The range of scores for letter grades of *A* and *E* is either 1 sigma wide or from the upper limit of *B* to the end of the distribution for *A* and from the lower limit of *D* to the end of the distribution for *E*, when the total range is wider than ±2.5σ.

Figure 3 is a frequency polygon showing the data for Table II. The percentage of cases making each letter grade is given.

These are not the exact percentages that could be found in a normal curve with a range of $\pm 2.5\sigma$ divided into five equal steps. The exact percentages in whole numbers of such a curve are: E, 7 per cent; D, 24 per cent; C, 38 per cent; B, 24 per cent; and A, 7 per cent.

3. Comparing normal percentage plan and sigma plan. These two plans really give slightly different definitions of letter grades; and, since a grade is what we define it, we cannot expect these two plans (or any other plans) to give exactly the same grade to the same pupils.

The sigma plan really defined the middle group, grade C, as the middle 38 per cent, approximately, because $\pm .5$ sigma set off, in a perfectly normal distribution, approximately the middle 38 per cent. In the normal percentage plan we defined the middle group as the middle 44 per cent. The middle 44 per cent will be approximately $\pm .58$ sigma. Yet, when we compare the two plans in this small class of 23 pupils, we find that they give almost exactly the same grades. Taking data from Table II, the percentage system gives the following:

23 cases $\times$ 6% = 1 or 2 cases for grade of A (1.38, exactly)
23 cases $\times$ 22% = 5 cases for grade of B (5.06, exactly)
23 cases $\times$ 44% = 10 cases for grade of C (10.12, exactly)
23 cases $\times$ 22% = 5 cases for grade of D (5.06, exactly)
23 cases $\times$ 6% = 1 or 2 cases for grade of E (1.38, exactly)

One difference is in the number of cases making the letter grade of C, the middle group, and here is the largest difference in definition. The only other difference is the fraction of .38 for grades A and E, which have to be counted an even number of cases.

The following suggestions are made for choosing a plan for converting scores into grades: In small classes, with short tests covering a limited amount of material and for a short period, use the percentage plan (see Table I). In larger classes, or in smaller classes for longer tests covering much material for a longer period of time, use the sigma plan. For all pupils in a whole school in one grade, or all grades (and for more than 100 pupils on almost any test), use the sigma plan. The real difference is in the range or spread of scores. For a limited range use the percentage plan, but for wider range use the sigma plan. The normal percentage plan is not so accurate

as the sigma plan. All semester grades should follow the sigma plan.

Table III shows the difference in the percentages of cases for each of the letter grades of A, B, C, D, and E by the two plans.

TABLE III

PERCENTAGE OF CASES FOR EACH LETTER
GRADE BY THE SIGMA PLAN AND THE
NORMAL PERCENTAGE PLAN

Letter Grade	Percentages by Sigma Plan	Percentages by Normal Percentage Plan
A........	7	6
B........	24	22
C........	38	44
D.......	24	22
E.......	7	6

Some authorities, such as Ruch,[19] give what is called a "Normal Distribution of School Marks," and the following percentages:

Letter grade of A............................. 6%
Letter grade of B............................. 25%
Letter grade of C............................. 38%
Letter grade of D............................. 25%
Letter grade of E............................. 6%

But this plan is rather a "binomial percentage plan." The percentages are taken from the coefficients of the expansion (in the above case with 5 steps):

$$(x + y)^4 = x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4.$$

The sum of the coefficients $(1 + 4 + 6 + 4 + 1)$ is 16. The numbers of expectancy for the terms are, therefore:

$$\tfrac{1}{16} + \tfrac{4}{16} + \tfrac{6}{16} + \tfrac{4}{16} + \tfrac{1}{16};$$

or, in terms of percentage: 6, 25, 38, 25, and 6.

III. Clinical Grading System

1. The use of standard scores for clinical records in schools. The importance of accurate and highly detailed clinical records in schools similar to those used in hospitals has been pointed out. The necessity of having a unit of measure that is com-

---

[19] Ruch, G. M., *The Objective or New Type Examination*, Chicago, Scott, Foresman Company, 1929, pp. 379–380.

parable for all scores in all subjects is perfectly apparent. One wishes to compare achievement in school subjects with intelligence, and intelligence with measures of personality and character. This can be done only when all measurements are reduced to the same common unit. Standard scores[20] derived from sigma offer the most accurate and simple unit that statisticians have suggested. Standard score units are comparable and similar to linear measure, such as inches; that is, they are in equal linear steps. Just as the distance from one inch to two inches is the same as the distance from two inches to three inches, so the distance from one standard score to two standard scores is the same as the distance from two standard scores to three standard scores.

The standard score is simply the deviation of a score $(X - M)$ from the mean divided by the sigma, the mean and the sigma being calculated from the same distribution. The formula is:

$$z = \frac{d}{\sigma}.$$

Since the calculation for deviations and sigma has been explained, there is no new step introduced in the calculation of a standard score. An illustration will show how very simple the standard score is. If the mean is 20, sigma is 4, and a child makes a score of 24, his deviation is $+4$; and a deviation of $+4$ divided by a sigma of $+4$ gives him a standard score of $+1$. A standard score of $+1$ has a $+1$ sigma position on the base line of a normal curve or frequency polygon. If this child makes the same standard score in reading and arithmetic, we can very accurately say that, in his group and according to the test used, the child reads as well as he calculates in arithmetic. Only through such a common unit can such comparisons be made. Comparisons of this nature are of the most vital and far-reaching importance for educational and vocational guidance. Standard scores furnish a very accurate clinical record to be used by educators in studying and understanding children. It is not a score that is administratively practical to give to parents and children, but hospital clinics have many measurements that they do not pass to patients and friends. There is no reason why the school should not set up a rather technical and com-

---

[20] Kelley, Truman L., *Interpretation of Educational Measurements*, Yonkers-on-Hudson, N.Y., World Book Company, 1927, pp. 181–182.

paratively simple unit of measurement for all subjects and carry this through for the whole educational career of the child. The standard score can be used as a unit of measure for the tests that a teacher makes up, for tests that are standardized in a whole school system, a state, or the nation, and for semester grades. If all standardized tests had this unit, the teacher could compare the achievement of her pupils on her tests with their achievement on tests standardized on a much wider basis. Well-standardized tests give the mean, sigma, and distribution. Standard scores can be calculated from these data.

2. **Illustration of the calculation for standard score and letter grades.** In Table IV are given the actual scores of a class for one semester. These scores include points made on readings, term papers, objective tests, and subjective tests. The lowest score in the class of 64 pupils was 355 points, and the highest score was 478 points.

In calculating the standard score, column d/σ in Table IV, the following processes are followed: The mean and sigma are first calculated. The deviation of each score from this mean is calculated by simple subtraction, taking care to observe the correct sign, as $d = X - M$. The deviations above the mean are plus and the deviations below the mean are minus. These are shown in the d column. The sigma is 26.5. Dividing sigma into each respective d will give the standard score, recorded in the column d/σ. For practical use, one decimal would be sufficiently accurate, as most distributions of a hundred cases will not go beyond $\pm 2.5\sigma$, making a total range of 5σ. The scores of this class have a range of from -2.20σ to $+2.44\sigma$. One can read the letter grades without any further calculation. The grade of C will represent a range from a standard score of $-.50$ to $+.48$, or raw score (column X) of 400 to 426. The letter grade of B will run from the standard score of $+.52$ to $+1.23$, or raw score from 427 to 446. The letter grade of A will run from the standard score of $+1.54$ to the end of the distribution, or from the raw score 454 to 478. Below the middle group, the letter grade of D will run from the standard score -65 to -122, or from the raw score 396 to 381. The E group will run from the standard score of -1.82 to the end of the distribution, or from the raw score 365 to 355. In Table IV the scores which have no frequency are omitted, and this is not a fair presentation of the data. The lowest D is 381 points, while the highest E is 365 points, or 16 points

from the lowest D. One would be prone to call the four cases having scores of 365, 364, 362, and 355 failures because they are removed some distance from the lowest D. When one starts with a score of 381 and goes up, there is practically no break until the highest B is reached. Certainly the letter grades in this table represent a very accurate picture of the accomplishments of this class, while the standard scores give a more accurate or clinical record of achievement. The standard score is a true rank in which the difference from one unit to the other is the same. This is a true concept of a linear scale with equal units. Letter grades based on such comparable and accurate measurements will be met with respect and will give a new impetus to the meaning of grades. They will make it possible for teachers to talk in more accurate terms than A, B, C, D, and E and to better understand the relative achievement of children.

A number of other comparable scores have been proposed. One of the most widely known is the T score developed by McCall,[21] which is based upon the scores of 12-year-old children. This scale runs from -5σ to $+5\sigma$, with the -5σ at $0T$; the mean, or 0σ, at $50T$; and $+5\sigma$ at $100T$. The M scale suggested by Russell[22] uses the T scale technique for children of any age on any classroom tests. The T and M scales are very wide scales—much wider than would be used in most schools. Thorndike and McCall[23] report T scales in reading as low as 22 and as high as 89 for 78,800 cases ranging from pupils in Grade II to superior teachers. The more cases, other things being equal, the wider will the distribution be and the farther out on the sigma scale will the extremely high and low cases be found. For nearly all cases in public schools, plus and minus 2.5 sigma give a sufficiently wide range. This includes 98.76 per cent of all cases.

3. R scale and R scores. A scale ranging from -2.5 to 2.5 is proposed. Zero is set at -2.5σ and 100 is set at $+2.5\sigma$. Each one-half sigma is 10 units wide, and the mean or zero sigma will be 50. The standard score can then be reduced to this shortened scale, which is similar to the T scale and only

[21] McCall, William A., *How to Measure in Education*, New York, The Macmillan Company, 1923, pp. 272–306.

[22] Russell, Charles, *Classroom Tests*, Boston, Ginn and Company, 1926, pp. 269–278.

[23] Thorndike, Edward L., and McCall, William A., Thorndike-McCall Reading Scale, Form I, "Directions for Using," p. 4, New York City, Bureau of Publications, Teachers College, Columbia University, 1921.

half as long. This scale, as compared with standard scores, is illustrated in Figure 4. It can be designated the "*R* scale," or the scale that is *Right* for practical uses by classroom teachers. Scores will be *R* scores. These scores are equal in linear steps; that is, a distance of 1*R* is the same distance at any position in the scale. Since the range from 0*R* to 100*R* includes 99 per cent of all cases, it will be very rarely that, in a classroom of not more than fifty children, a single case will fall below 0 or above 100. If this happens, the case may be set at 0 or 100.

R Score

| 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

| -2.5 | -2. | -1.5 | -1. | -.5 | 0 | +.5 | +1. | +1.5 | +2. | +2.5 |
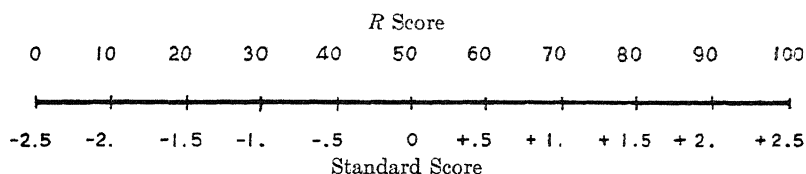
Standard Score

Fig. 4.   The *R* Scale and Standard Score Scale Compared.

Computation of **R** *scores.*   The computation of the *R* scale is simple once the standard scores are calculated.   The rule is: Add 20 times the standard score, with its proper sign, to 50.   The formula is:

$$R \text{ score} = 50 + \frac{20(X - M)}{\sigma},$$

or

$$R \text{ score} = 50 \pm 20z.$$

If an *R* score is minus (below the mean), the numerical value of the $(X - M)/\sigma$ times 20 is subtracted from 50; if the *R* score is positive (above the mean), the numerical value of the d/σ times 20 is added to 50.   The *R* scores of the highest raw score and lowest raw score from Table IV will be:

For the highest raw score of 478, standard score 2.44,

$$R \text{ score} = 50 + 20\frac{64.72}{26.5}$$
$$= 50 + 20 \times 2.44$$
$$= 98.8$$

For the lowest score of 355, standard score -2.20,

$$R \text{ score} = 50 + 20\frac{-88.28}{26.5}$$
$$= 50 + 20 \times -2.20$$
$$= 6.0$$

TABLE IV
FREQUENCY DISTRIBUTION, DEVIATION, STANDARD SCORE, R
SCORE, AND NUMBER OF CASES MAKING EACH LETTER
GRADE OF A, B, C, D, AND E, WITH THE NUMBER OF
CASES, MEAN, SIGMA, AND RECIPROCAL OF SIGMA
OF THE DISTRIBUTION

X	f	d	$\dfrac{d}{\sigma}$	R SCORE	NO. OF CASES	LETTER GRADES
478	1	64.72	2.44	98.8		
472	1	58.72	2.22	94.4		
463	1	49.72	1.88	87.6	6	A
460	1	46.72	1.76	85.2		
455	1	41.72	1.57	81.4		
454	1	40.72	1.54	80.8		
446	1	32.72	1.23	74.6		
443	1	29.72	1.12	72.4		
439	1	25.72	.97	69.4		
438	2	24.72	.93	68.6		
435	2	21.72	.82	66.4	15	B
431	1	17.72	.67	63.4		
430	2	16.72	.63	62.6		
429	2	15.72	.59	61.8		
427	3	13.72	.52	60.4		
426	3	12.72	.48	59.6		
424	1	10.72	.40	58.0		
423	3	9.72	.37	57.4		
420	1	6.72	.25	55.0		
417	1	3.72	.14	52.8		
416	2	2.72	.10	52.0		
414	1	.72	.03	50.6	23	C
409	1	− 4.28	− .16	46.8		
408	1	− 5.28	− .20	46.0		
405	3	− 8.28	− .31	43.8		
403	2	−10.28	− .39	42.2		
402	1	−11.28	− .43	41.4		
401	1	−12.28	− .46	40.8		
400	2	−13.28	− .50	40.0		
396	2	−17.28	− .65	37.0		
395	1	−18.28	− .69	36.2		
393	1	−20.28	− .77	34.6		
392	2	−21.28	− .80	34.0		
391	1	−22.28	− .84	33.2		
390	2	−23.28	− .88	32.4	16	D
386	3	−27.28	−1.03	29.4		
384	1	−29.28	−1.10	28.0		
383	1	−30.28	−1.14	27.2		
382	1	−31.28	−1.18	26.4		
381	1	−32.28	−1.22	25.6		
365	1	−48.28	−1.82	13.6		
364	1	−49.28	−1.86	12.8	4	E
362	1	−51.28	−1.94	11.2		
355	1	−88.28	−2.20	6.0		

$$N = 64$$
$$M = 413.28$$
$$\sigma = 26.5$$

In calculating R scores, each deviation is divided by sigma (d/σ), a process that takes considerable time. However, since σ is a constant in a whole distribution, dividing each d by σ is the same as multiplying each d by the reciprocal of σ. In Table IV, $\sigma = 26.5$, and the reciprocal $\left(\dfrac{1}{26.5}\right)$ is .0377. Taking the deviation of the highest raw score as an illustration, $d = 1\ \sigma$ is $64.72 \times .0377$, which is 2.4399, or 2.44, as given in Table IV.

Table V is given as a ready means of showing the relation of standard scores, R scores, letter grades calculated by the sigma plan, and the percentage of cases below a given R and standard score in a perfectly normal distribution. These percentages of cases are equivalent to the percentile score in a normal distribution. The percentile score indicates the percentage of students who are below a particular student. For example: A student who makes an R score of 90 (if the distribution is normal) will be better than 97.72 per cent of other students, or his percentile score is said to be 97.72.

There is no reason why the technique of the T scale may not be universally accepted, except for the historical prestige carried by Doctor McCall and the widely used Thorndike-McCall Reading Tests, which were standardized for 12-year-old children. The main difference between the R scale and the T and M scales is the difference in the range. The R scale has a range of 5σ, running from -2.5σ to 2.5σ, while the T and M scales have a range of 10σ, running from -5σ to $+5\sigma$. The R scale is more practical from the standpoint of classroom practices and for the treatment of small groups when the range is not so great as when many standardized tests covering the range of several grades are used. R scores are particularly adaptable to diagnostic demand and interpretation in the classroom. These scores are not recommended for general survey purposes. Here percentiles and scores based on a 10σ range are to be preferred. These scores are well explained by the many standardized survey tests on the market. They have been given major attention in the past because historically survey tests were simpler and naturally appeared first. Diagnostic tests for classroom use are fairly recent products of educational science.

In large school systems where there are many children in each grade, the school may desire to use the same test over a wide range of talent, and the total range will place a few children

(exactly, 1.24 per cent) beyond the plus and minus 2.5σ.   The modified T score of McCall will make a simple scale that will

TABLE V

STANDARD SCORE, EQUIVALENT R SCORE, EQUIVALENT LETTER GRADE, AND PERCENTAGE OF CASES BELOW EACH R AND STANDARD SCORE

R Score	Standard Score	Letter Grade	Percentage Below	R Score	Standard Score	Letter Grade	Percentage Below
100	+2.5		99.38	48	− .1		46.02
98	+2.4		99.18	46	− .2		42.07
96	+2.3		98.93	44	− .3	C	38.21
94	+2.2		98.61	42	− .4		34.46
92	+2.1		98.21	40	− .5		30.85
90	+2.0	A	97.72	38	− .6		27.43
88	+1.9		97.13	36	− .7		24.20
86	+1.8		96.41	34	− .8		21.19
84	+1.7		95.54	32	− .9		18.41
82	+1.6		94.52	30	−1.0	D	15.87
80	+1.5		93.32	28	−1.1		13.57
78	+1.4		91.92	26	−1.2		11.51
76	+1.3		90.32	24	−1.3		9.68
74	+1.2		88.49	22	−1.4		8.08
72	+1.1	B	86.43	20	−1.5		6.68
70	+1.0		84.13	18	−1.6		5.48
68	+ .9		81.57	16	−1.7		4.55
66	+ .8		78.81	14	−1.8		3.59
64	+ .7		75.80	12	−1.9		2.87
62	+ .6		72.57	10	−2.0	E	2.28
60	+ .5		69.15	8	−2.1		1.79
58	+ .4		65.54	6	−2.2		1.39
56	+ .3	C	61.79	4	−2.3		1.07
54	+ .2		57.96	2	−2.4		.82
52	+ .1		53.98	0	−2.5		.62
50	.0		50.00				

include the extreme ranges of talent.   The formula for the T scale for any grade is:

$$T \text{ score } = 50 + \frac{10(X - M)}{\sigma}.$$

This places zero T at -5.0σ, $50T$ at the mean, and $100T$ at $+5.0\sigma$.   To compare the R score and the T score at any time, R score may be converted into T score by the formula:

$$T \text{ score } = 25 + \tfrac{1}{2}R \text{ score};$$

but all T's below 25 will be R scores of zero or below, and all T's above 75 will be R scores of 100 or above, because the R scale is half as long as the T scale. However, if standard scores (z scores) are used (and it will be remembered that they are simply the deviations of a mean from a score divided by sigma), z scores may be converted into T scores by the formula:

$$T \text{ score} = 50 + 10(\pm z).$$

As z scores above the mean are plus and z scores below the mean are minus, the sign must be noticed. It must be remembered that the original definition of the T scale by McCall in *How to Measure in Education* takes the scores of twelve-year-old children as the basis of the distribution.

The student or teacher does not have to memorize these formulas, but she must see the logical relations of the scores, as follows:

1. Z scores are points located on the base line of a polygon, running from the mean up and down with plus and minus sigma, respectively.

2. R scores range from -2.5σ, as zero, to $+2.5\sigma$, as 100; and each R score is 20 times as wide as a z score.

3. T scores range from -5.0σ, as zero, to $+5.0\sigma$, as 100; and each T score is 10 times as wide as a z score.

4. R score of zero starts at $25T$, and R score of 100 ends at $75T$.

5. In all formulas, 50 is added to the standard score times the constant. In the case of R scores, the constant is 20. In the case of T scores, the constant is 10.

These relations are clearly shown by Figure 5, which has all the scores on a linear scale.

-5.0	-4.0		-3.0	-2.5	-2.0	-1.5	-1.0		-.5	0	+.5	+1.0	+1.5	+2.0	+2.5	+3.0		+4.0		+5.0
										σ score										
0	10		20	25	30	35	40		45	50	55	60	65	70	75	80		90		100
										T score										
				0	10·	20	30		40	50	60	70	80	90	100					
										R score										
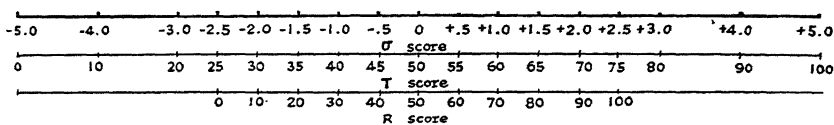
Fig. 5.   Comparison on a Linear Scale of the σ or Z Scores, T Scores, and R Scores.

4. Weighting units to be considered in a grade for a semester or term. If weights are desired for certain units and the opinion of the teachers is not desired, statistical weights may be determined from the standard deviations, not from the means

of the distributions of each set of scores. If scores are weighted in proportion to the size of the means, too much importance will be given to the distribution having the larger means. An illustration will make this clear. Suppose that the mean and sigma of test 1 are 20 and 5, respectively, and that the mean and sigma of test 2 are 120 and 20, respectively. If a given person makes the mean on both tests and the means are added, his total is 140 points, or test 1 is given six times as much weight as test 2. Suppose that it is desired to give the two tests equal weights; then equalize the distribution of the smaller, test 1, by multiplying the scores on test 1 by 4, since the deviation of test 2 is 4 times the deviation of test 1 ($20 \div 5 = 4$). This method may be used to equalize any set of scores and determine equal weights. Of course, arbitrary weights may be given in terms of importance, and within one class this is acceptable. With tests used by several teachers, weights may be determined by the pooled opinion of all the teachers concerned.

IV. Rating Subjective Examinations

1. Rating subjective examinations as a whole. Scoring subjective examinations cannot be done, but we can arbitrarily assign certain point values to our judgment of essay examinations. In Chapter I it has been shown that teachers cannot accurately *grade* subjective examinations; but teachers can *rate* subjective examinations according to certain rules, and these ratings will agree more nearly than grades assigned by the usual plan of grading. Subjective examinations measure, though not very accurately, the organization of knowledge in written essays. What they measure *is* important. What is needed is a more accurate method of measurement. By accuracy of judgment is meant closer agreement of judges. If judges disagree by as much as 40 points, or 40 per cent, their judgment is not so accurate as if they disagreed by only 10 points, or 10 per cent. The rating of subjective examinations must follow some of the principles of grading previously described. The plan recommended involves three steps:

First: Do not try to differentiate more or fewer than five divisions of quality. Read the papers and pile them into five piles (these correspond to the five subdivisions of the grading system). Do not think of letter grades, but think only of quality in terms of the subject matter or function being

graded.   Eliminate the personalities of the students by having names written on the papers where they cannot be seen.   Make quality the basis of rating by disregarding mechanics of writing (spelling, punctuation, handwriting, and so forth).

Second: If the five resulting piles do not have the number of papers corresponding with the normal percentage distribution (6, 22, 44, 22, and 6 per cent, approximately), then reread and adjust papers higher or lower or both, as the case may require, until the piles have approximately these percentages of papers. This simply follows the principle that if no scientific measurement of the distribution is known, normal distribution may be assumed.

Third: Assign arbitrarily to each pile number values corresponding to the numerical values of the five letter grades made on objective tests which cover *about the same amount of material or the same amount of time in studying.*   For example: Suppose that the subjective examination measures work equal in time and amount to the work covered by the objective test data on which appear in Table II.   Take the middle score for each letter grade and assign these points to the respective five piles, giving no part or fractional values (as this accuracy does not exist in ratings, and it is a great error to try to rate something more accurately than human judgment can).   The five piles would receive approximately the following point scores:

Highest pile, or *A* papers............................ 41 points
Next   pile, or *B* papers............................ 34 points
Next   pile, or *C* papers............................ 25 points
Next   pile, or *D* papers............................ 16 points
Lowest pile, or *E* papers............................ 9 points

The original presentation of a similar plan of rating subjective examinations was made by Sims,[24] who found that this method of rating would give a more reliable score than the use of the objective plan.

The writer, in two courses in educational measurements, with 31 and 64 students, respectively, assigned the topic "A Reliable Grading System For Public Schools" as a term paper. Both the writer and his assistant, who had also taught these courses, rated the papers of both classes according to the plan being discussed.   The rules used in rating were the same as those

---

[24] Sims, Vernon M., "The Objectivity, Reliability, and Validity of an Essay Examination Graded by Rating," *Journal of Educational Research*, Vol. XXIV (October, 1931), pp. 216–223.

described above and not those of the plan used by Sims or the additional suggestions given by Greene and Jorgensen.[25] The correlation for the class of 31 was .88 and that for the class of 64 was .91. In the next chapter the meaning of these correlations will be explained. At the present time it is necessary only to say that these agreements of two independent raters are very much higher than those found in subjective grading. As a matter of fact, these correlations are about as high as the reliability of short objective tests.

2. Counting ideas in subjective examinations. The plan of counting the number of ideas in a composition or paper has been very widely used by teachers for many years. For an examination, the teacher either writes ideal answers and counts the number of ideas which should be included in each answer, or determines the number of ideas she expects in a perfect or a complete answer to each question. The total number of these ideas represents a maximum score on the examination. In grading an examination by points, any idea which is acceptable is given one point. Usually mechanics of writing and sentence structure are omitted in all subjects except English, as validity is increased by measuring these factors separately. Spelling can best be tested by a spelling test in which the number of words correctly spelled becomes a very accurate score. English usage should not be tested by such a test; one of the objective forms illustrated in this text, of which the sentence completion is the most valid, should be used for this purpose. If the number of ideas assigned to the correct answer on a question would influence the amount of time or care a pupil would devote to answering the question, the teacher should inform the pupil of the maximum score for each question. This is both a courtesy to the student and a method of raising the validity of the test, because all pupils will know the weights assigned to the respective questions.

The writer and his assistant in undergraduate courses in education and measurements have obtained the following coefficients of reliability by independently counting ideas: On an examination on the advantages and limitations of objective tests covering 67 ideas, with 62 students, the correlation is .93; on an examination concerning grading covering 56 ideas,

---

[25] Greene, Harry A., and Jorgensen, Albert N., *The Use and Interpretation of Elementary School Tests*, New York, Longmans, Green and Co., 1935, pp. 55–57.

with 72 students, the correlation is .91; on an examination concerning the nature of intelligence covering 43 ideas, with 45 students, the correlation is .88. These reliabilities are as high as those obtained by many objective tests of equal length with equal numbers of students.

This plan of counting ideas can be carried into the measurement of English usage and mechanics. Instead of counting correct usage or the opportunity for correct usage where there are errors, it is much easier, more reliable, and more objective to count the number of incorrect responses, multiply by 100, and divide by the number of running words to reduce the influence of length to a common denominator. This will give an error score, the formula of which is:

$$\text{Error Score} = \frac{\text{Number of errors} \times 100}{\text{Number of running words}}.$$

This is one of the most accurate methods of measuring English usage and has been used by Beck[26] to validate the completion form as a measure of usage. If this method of measuring usage is used, the higher scores will be low numbers and the lower scores will be high numbers, as zero errors per hundred running words means a perfect composition from the standpoint of mechanics. A method of converting these scores into a positive form of score where the high scores represent high achievement would be to set a perfect paper at a given number of points, say 50, 60, or any number that would carry about the right weight for the length and difficulty of the examination. Calculate the error score to one decimal place (and this is sufficiently accurate for most compositions), multiply the error score by the tens of the maximum score, or one less than the tens of the maximum score, and subtract from the maximum score. A very poor composition will not have more than from 10 to 15 errors per 100 running words. If the maximum score is set at 50, and 10 errors per 100 running words is about as poor as may be found on any paper, then if the multiplier is set at 5 the poorest paper will be worth 0 ($50 - 10 \times 5 = 0$). If, however, there are more than 10 errors per 100 running words, it would probably be wise to make the multiplier 4. Suppose that the maximum number of errors in any paper is 11, the multiplier is set at 4, and the maximum score is 50; then the worst paper, with an

---

[26] Beck, Roland L., *op. cit.*, 1932, pp. 49–74.

error score of 11, would receive a final score of 6 (50 − 11 × 4 = 50 − 44 = 6). The rule, then, for converting error scores into scores would be simply to multiply the error score by a constant and subtract from an arbitrarily assigned maximum.

3. Rating subjective examinations by an objective key of answers. Evidence has been presented in Chapter I to show how inaccurately teachers grade a paper in mathematics. This seems inconsistent because the answers to mathematical problems, at least in elementary and high schools, are perfectly definite and uniform to every teacher. It would appear that the grading of mathematics is perfectly objective, but the difficulty comes in deciding what to count and what weights to assign to those items that are counted. For instance, teachers disagree on what to count numbers which are copied wrong, such as 64 copied as 46, or 64¢ copied without the cents sign or without the dollar sign and the decimal.

Garrison[27] has proposed a method of making the key of answers to an algebra examination objective, and has presented the difference between grading the same set of examinations by the subjective method and by his proposed objective method. An exact copy of one of his examinations with the objective key of answers and rules for scoring is given on page 172 of Chapter VII. He had ten different teachers grade twenty examinations by both the subjective and objective plans. Table VI is taken from his thesis and shows the disagreement of the same ten teachers on the same students' examinations in grading by the usual subjective method. The average disagreement by the subjective plan is 41.5 per cent. Table VII shows the grades given by the same ten teachers on the same twenty examinations with the objective key of answers. The average disagreement by the objective plan is 7.1 per cent. This method can be used in all subjects in which there is any computation.

A somewhat similar plan of measuring problem-solving in chemistry is the objective test illustrated on page 208, Chapter VII, which was proposed by House.[28] The same scheme will work in problem-solving in arithmetic, physics, and other similar subjects.

4. Combining objective scores and subjective ratings for a monthly or semester grade. Since both subjective and objec-

---

[27] Garrison, J. Don, *Objectifying the Grading of Algebra Examinations*, unpublished master's thesis, University of Oklahoma, 1936.
[28] House, *op. cit.*, 1934, pp. 15–31.

tive examinations can now be marked in points, these may be added and the total number of points converted into grades by the plans already explained. Point scores on outside readings, term papers, subjective examinations, and even class recitations may be added to objective test points to obtain a sum of points for a semester or term grade. The total points of a class are shown in Table IV, where points are also converted into standard scores, R scores, and letter grades.

TABLE VI

PERCENTAGE GRADES GIVEN BY SUBJECTIVE GRADING BY TEN TEACHERS TO TWENTY STUDENTS' PAPERS IN ELEMENTARY ALGEBRA

STUDENT NUMBER	PERCENTAGE GRADE BY TEN TEACHERS										MEAN	RANGE
	1	2	3	4	5	6	7	8	9	10		
1	79	71	30	78	70	65	58	73	79	86	68.9	56
2	62	64	97	90	72	82	75	78	83	78	78.1	35
3	65	77	72	50	79	70	80	76	85	81	73.5	35
4	58	50	80	46	49	60	44	61	69	77	59.4	33
5	44	50	86	21	35	37	44	61	63	66	50.7	64
6	44	42	82	69	51	50	65	67	75	77	62.2	40
7	44	50	80	73	49	40	65	62	72	82	61.7	42
8	37	35	40	60	42	30	38	48	62	66	45.8	36
9	30	31	51	78	37	40	44	61	64	63	49.9	48
10	30	28	70	39	28	44	37	42	58	54	43.0	42
11	30	28	50	57	21	30	44	42	51	47	40.1	37
12	30	28	22	38	28	32	37	41	45	47	34.9	25
13	23	21	33	21	21	26	20	39	56	60	32.0	40
14	23	21	45	32	21	25	20	40	78	51	35.7	58
15	23	21	10	27	21	30	25	51	70	50	32.8	60
16	23	21	30	33	21	25	30	34	54	49	32.0	33
17	7	9	46	22	7	19	6	11	44	28	17.7	40
18	12	7	40	0	0	0	0	7	23	19	10.8	40
19	47	42	50	63	35	37	39	61	58	67	50.0	32
20	85	67	100	99	79	90	93	92	97	94	89.6	33
Mean	39.8	38.15	55.7	50.25	35.8	41.6	43.2	52.35	64.3	62.1	48.44	41.5

5. Illustration of a cumulative record of one student for a semester. The original or raw scores from Table IV came from a comprehensive and accumulative record of a class in educational measurements taught by the writer. The complete

record for one semester for one student from this class is shown in Table VIII.

TABLE VII

POINT SCORES AND PERCENTAGE GRADES[a] GIVEN BY OBJECTIVE SCORING BY TEN TEACHERS TO TWENTY STUDENTS' PAPERS IN ELEMENTARY ALGEBRA

STUDENT NUMBER	POINT SCORE AND PERCENTAGE GRADE BY TEN TEACHERS										MEAN	RANGE
	1	2	3	4	5	6	7	8	9	10		
1	82	83	83	84	83	80	78	83	83	83	82.2	6
2	80	81	81	81	80	78	82	80	81	80	80.4	4
3	81	80	81	79	79	79	80	81	83	82	80.5	4
4	70	68	71	69	68	68	68	68	70	70	69.0	3
5	74	74	75	70	72	73	73	71	74	74	73.0	5
6	62	72	73	72	73	69	75	73	69	69	70.7	13
7	75	76	80	79	82	68	74	79	79	81	77.3	14
8	56	56	57	62	60	55	54	60	62	62	58.4	8
9	63	60	57	63	60	60	58	67	64	62	61.4	10
10	41	41	45	41	45	42	40	42	41	41	41.9	5
11	48	49	49	47	48	48	49.	47	50	50	48.5	3
12	55	50	51	58	52	50	48	58	56	56	53.4	8
13	53	53	54	54	53	51	52	51	53	53	52.7	3
14	62	58	65	65	62	62	53	60	59	59	60.5	12
15	61	60	58	56	57	57	63	57	61	61	59.1	5
16	39	38	41	37	40	35	36	36	44	42	38.8	9
17	35	34	33	27	35	34	36	33	34	33	33.4	9
18	22	20	20	20	21	21	19	20	21	21	20.5	2
19	59	68	62	68	69	56	68	68	70	70	65.8	14
20	92	95	94	98	94	92	95	94	96	95	94.5	6
Mean	60.5	60.8	61.5	61.5	61.65	58.9	60.05	61.4	62.5	62.2	61.1	7.1

[a] Since there were 98 points in the test, the percentage grade was taken to be the same as the point score.

Objective examinations are more reliable than subjective examinations; therefore they should have more weight in making a final grade. Two plans for doing this are possible. If the same number of both types of tests are used, multiply the scores on objective tests by a multiplier as high as 2 or 3, or give more objective tests than subjective tests so that the total number of objective points exceeds by a multiple of 2 or 3 the total number of points that come from subjective examinations and personal judgment.

The plan of grading just described, which bases its accuracy upon the accumulation of points determined from valid and reliable subjective and objective examinations, or from measuring instruments of any type, is similar to the system of points accumulated by individuals and members of a track team at a track meet. The man who wins the largest number of events is awarded the gold medal or gets a grade of A. In school and in all occupations of life, people are also awarded medals of some form—grades, promotions, continuance in jobs without promotion, reduction in salary, and discharge. These things are largely determined by an accumulative process, just as the winner of the track meet must accumulate points from many events. So the student must accumulate points in the many

TABLE VIII

POINT SCORE ON EACH ITEM COUNTED FOR ONE
SEMESTER FOR ONE STUDENT,[a] THE TOTAL POINT
SCORE, THE STANDARD SCORE, R SCORE, AND
LETTER GRADE

ITEM	POINT SCORE
Reading Cards—12; 2 points each.....	24
Objective quiz (True-False)......................	42
Unit paper (subjective rating).....................	14
Objective quiz (matching)........................	24
Subjective examination (count of ideas).............	24
Problem (objective key)..........................	46
Problem (subjective rating).......................	12
Objective quiz (sentence completion)...............	31
Objective test (simple recall).....................	63
Problem (subjective rating).......................	42
Subjective examination (count of ideas).............	24
Term paper (count of ideas)......................	52
Final objective examination (multiple choice, simple recall, and matching)...........................	80
Total semester points...........................	478
Standard score.................................	+2.44
R score.......................................	98.8
Letter grade...	A

[a] This student made the highest score in the class and is the student with a raw score of 478 in the distribution in Table IV.

phases of each subject to which he is exposed. This is a true measure of progress and probably a much more valid measure of progress or growth than the distance from an initial test to a final test. The serious objections to the measure of progress

between an initial test and a final test is the lack of sampling in both tests. In an initial test with many subjects, such as algebra, a student starts with practically no knowledge, while no final test of algebra of any reasonable length can adequately sample all of the important factors that the students have learned in one year of nine months with approximately an hour's recitation in every school day. In addition, this measure of progress does not permit diagnosis at different steps in the line of progress, while the grading plan here proposed permits a diagnosis at every step or every learning unit. The writer hopes that this scheme is such a fair measure of growth as progressive educational philosophers have so loosely defined, inadequately determined, and eloquently demanded. The writer is cognizant of the "New Development in Marking" by Bixler[29] and the review on report cards by Messenger and Watts.[30]

An accumulation record system for individual students similar to that presented in Table VIII requires some bookkeeping; but of all the production plants the writer has seen, an educational plant has the poorest and most meager system of bookkeeping, especially for the fundamental and important thing which the plant produces, that is, human learning. The writer's own system of bookkeeping, which he has employed for two decades in college, consists of a 5 by 8-inch card for each student with important personal information about the student and space for recording any kind of work done by the student which can be scored or rated. A card of this size provides space for entering at least twenty separate items and a place for the score on the final examination, the total, the letter grade, R score, and remarks. It is printed on one side only and is much simpler than many records for keeping attendance and grades that the writer has used in public schools.

Another advantage of an accurate grading system is its diagnostic value. Immediately after the teacher has covered a unit of work, he should give comprehensive diagnostic tests. The objective test can be returned to the students so that they may see exactly what has been missed. Some of the subjective

[29] Bixler, Harold H., "School Marks," in *Review of Educational Research, Pupil Personnel, Guidance and Counseling*, Vol. VI (April, 1936), pp. 169–173.

[30] Messenger, Helen R., and Watts, Winifred, "Summaries of Selected Articles on School Report Cards," *Educational Administration and Supervision*, Vol. XXI (October, 1935), pp. 539–550.

tests also can be returned. The difficult items of tests of both types can be reviewed by the teacher in class. Where textbooks are used and the tests are based on the textbook, the teacher can mimeograph a key of answers containing the textbook page reference for each answer on the key. The writer, as editor of a series of state-wide tests[31] based on textbooks and courses of study in Oklahoma since 1931 and in Kansas since 1936, has used a key of answers with page references to books. A test with an individual key for each child, carrying textbook page references, is an invaluable aid to the child in studying everything that he has missed before new items are taken up in class. Immediately after such an examination, every child has automatically assigned to him by a key showing his right or wrong answers an individualized lesson on the items he has missed. The teacher spends his time for the next few days helping pupils individually.

While this book treats mainly of achievement measurement by the classroom teacher, the writer in no way would suggest that there are not other vital and important learning units to be measured. The point is made, however, that subject-matter achievement is worth measuring and can be measured accurately by the classroom teacher. The building of accurate instruments for measuring general ability, specific abilities, personality, character, general conduct, and citizenship is very complicated.

6. **Rating attitudes, character, and citizenship.** The importance of grading or rating these forms of conduct or achievement has been mentioned, but it is necessary to separate these from subject-matter achievement. Probably the single greatest cause of the unreliability of teachers' grades is the large number of different factors that they consider when they estimate the grade. Some teachers consider effort, some intelligence, some character, and some other factors. These things not only should be rated, but at least some of them should be reported to parents on report cards along with scholarship. All information should be combined in studying a child; but the purer the measurement in each phase of his life and learning, the more accurate will be our knowledge and the more nearly correct will be our diagnosis of this child and our treatment of him for maximum growth.

---

[31] Rinsland, Henry D., ed., Rinsland-Tracy Teaching Tests, Grades I to VIII, Saml Dodsworth School Supply Company, Kansas City, Missouri.

Until simpler tests of conduct are designed, the teacher can, at least, rate pupils in subjective qualities in the same manner that has been described for subjective examination rating in paragraph 3 above.   First, the teacher should consider very definite types of reactions rather than generalized, indefinite traits. Instead of rating a child on neatness, the teacher may rate the child on different kinds of neatnesses, such as neatness of dress and person, neatness of school desk and books, and neatness in written work and hand work.   Probably the teacher should use, not a scale of citizenship, but scales of separate conducts or behaviors that go to make up citizenship—such as courtesy to fellow students and teachers; consideration of shortcomings and superiority of other students; deportment toward superiors in school and on the school grounds; respect for rights of others in halls, classroom, and on the playground; and obedience to general regulations which involve the safety, welfare, and happiness of students, teachers, janitors, and supervisors.   Many pupils may have a good record in several of these but not such a good record in others.   Even in rating general traits, Hollingworth[32] has noted the fact that some traits can be rated with a higher degree of accuracy than other traits.   He found that efficiency, originality, perseverance, quickness, judgment, will, and energy may be rated with close agreement among judges. Leadership, reasonableness, independence, refinement, and physical health may be rated with fair agreement among judges. Courage, unselfishness, integrity, co-operativeness, cheerfulness, and kindliness (some of the most widely mentioned traits) are rated with poor agreement among judges.   When any of these traits are rated in five groups, the simplest definition of a letter grade is a percentage; that is, A is given to the highest 6 per cent, B to the next 22 per cent, C to the middle 44 per cent, D to the lower 22 per cent, and E to the lowest 6 per cent, approximately.   A report card carrying out this plan would probably be divided into two divisions, reporting first achievement and second conduct.

7. Standardized grades.   The grading methods that have been described might be called "relative."   In actual fact, all grades are relative.   A *grade* is an interpretation of a student's accomplishment in relation to the group in which he is graded.

---

[32] Hollingworth, Harry L., *Judging Human Character*, New York, D. Appleton-Century Company, 1922, p. 79.

This is as nearly scientific as can be; no plan can be highly scientific, because there are too many unknown factors involved. Standardized grades are also relative. They have been established by the writer[33] since 1931 in monthly objective examinations in every subject in the schools in Oklahoma, but the compilation of sufficient data to standardize grades is very expensive. The writer[34] has converted ratings of quality in handwriting into letter grades for nine handwriting scales for Grades I to VIII, but such a scheme is also too expensive for a local school. Where no uniform tests are used, standardized grades may be determined on a state-wide basis and each grade mean approximately the same achievement from one school to another if a uniform common denominator, such as a very comprehensive intelligence test, can be given every pupil. A standardized grade can, then, be calculated for a state by the use of the regression equation. This has been proposed by Toops,[35] who has developed formulas and procedure. Toops's method does not affect or raise the reliability of the original grade of each pupil. It is a refinement to which we may look after the improvements described in this book become well known to most teachers.

8. Exemptions from examinations. Under a plan of grading where grades depend upon accumulating points, exemptions from examinations cannot be made. There is no reason why examinations should be instruments of torture. When they are fair, reliable, and diagnostic and are given for the purpose of understanding children and measuring their growth and achievement, pupils do not fear examinations. A final examination should not count so much as it does. In Table VIII, the final test counts 80 points out of 478. The dread of a situation where the student either passes or fails on one examination is entirely removed. In the new scheme, pupils are not honored by being exempt from a final examination but are honored because they have scored more points than their competitors in every event. The system described has been used by the writer in his classes in educational measurements and has been adopted by many of his students in their schools. Both research and

---

[33] Rinsland, ed., 1931–36, *op. cit.*

[34] Rinsland, Henry D., The Practical Handwriting Scales, Grades I to VIII, Practical Drawing Company, Dallas, Texas, 1931.

[35] Toops, Herbert A., "The Transmutation of Marks," *Ohio College Annual Bulletin*, No. 88, mimeographed ed., Columbus, Ohio.

experience indicate that semester grades can be made highly reliable and fair.

9. Honor points. Honor points seldom serve any useful function. They are often used to create two separate standards—one for passing a course and one for graduating. If students have to make a certain number of honor points in addition to passing courses, there are two failure points. If the letter grades are given equivalent points, each letter grade must have a separate numerical value, as: E or F, 0; D, 1; C, 2; B, 3; A, 4. These points then can always be substituted for the letter grades for statistical treatment. Requiring students to make a certain grade point, as 2 or 2.5, for graduation simply means that passing a course is one thing and graduation is another. This scheme was probably invented by instructors to pass the responsibility of failure to other instructors, for under such a scheme a student could pass a course and yet make practically no progress toward graduation. Many colleges employ this method for "raising scholarship." The burden of proof is still with them. Certainly, for elementary and high school pupils, such schemes should not be employed.

Selected References on Grading Systems and Improved Grading[36]

Baker, Harry J., *Educational Disability and Case Studies in Remedial Teaching*, Bloomington, Ill., Public School Publishing Company, 1929.

Beck, Roland L., *The Reliability and Validity of a Natural Test in English Composition for High School Seniors and College Freshmen*, unpublished dissertation, University of Oklahoma, 1932.

Bixler, Harold H., "School Marks," in *Review of Educational Research, Pupil Personnel, Guidance and Counseling*, Vol. VI (April, 1936), pp. 169–173.

Ellis, Robert S., *Standardizing Teachers' Examinations*, Bloomington, Ill., Public School Publishing Company, 1927.

Enlow, Elmer R., *Statistics in Education and Psychology*, New York, Prentice-Hall, Inc., 1937.

Garrison, J. Don, *Objectifying the Grading of Algebra Examinations*, unpublished master's thesis, University of Oklahoma, 1936.

Gates, Arthur I., and Bond, Guy L., "Reading Disabilities," *Journal of the National Education Association*, November, 1936, pp. 243–244.

Gould, George, "Practices in Marking an Examination," *The School Review*, Vol. XL (February, 1932), pp. 142–146.

Greene, Harry A., and Jorgensen, Albert N., *The Use and Interpretation of Elementary School Tests*, New York, Longmans, Green and Company, 1935, pp. 55–57.

---

[36] A number of references in the footnotes are in addition to references in this list.

Hollingworth, Harry L., *Judging Human Character*, New York, D. Appleton-Century Company, 1922, p. 79.

House, Otis W., *A Measure of the Amount of Learning in High School Chemistry*, unpublished thesis, University of Oklahoma, 1934.

Hughes, W. H., *California Quarterly*, Vol. VIII, January, 1933, pp. 202–203.

Kelley, Truman L., *Interpretation of Educational Measurement*, Yonkers-on-Hudson, N. Y., World Book Company, 1927, pp. 181–182.

McCall, William A., *How to Measure in Education*, The Macmillan Company, 1923, pp. 272–306.

Messenger, Helen R., and Watts, Winifred, "Summaries of Selected Articles on School Report Cards," *Educational Administration and Supervision*, Vol. XXI, October, 1935, pp. 539–550.

Monroe, Walter S., *An Introduction to the Theory of Educational Measurements*, Boston, Houghton Mifflin Company, 1923, p. 219.

Motsenbacker, John D., *High School Marks and Marking Systems of Oklahoma*, unpublished thesis, University of Oklahoma, 1933.

National Society for the Study of Education, "Educational Diagnosis," *Thirty-fourth Yearbook*, Public School Publishing Company, 1935.

News of the School World, "Report Cards Abandoned by Newton Public Schools," *Journal of Education*, November, 1933.

Odell, C. W., "High School Marking Systems," *School Review*, Vol. XXXIII, 1925, pp. 346–354.

Rinsland, Henry D., The Practical Handwriting Scales, Teacher's Manual, The Practical Drawing Company, Dallas, Texas, 1930.

———, ed., Rinsland-Tracy Teaching Tests, Grades I to VIII, Saml Dodsworth School Supply Company, Kansas City, Mo., 1931–1936.

Rinsland, Martha O'D., *A Test for Measuring Teachers' Knowledge of the Conduct and Personality of Children from Six to Eight Years of Age*, unpublished doctor's dissertation, University of Oklahoma, 1936, p. 36.

Rogers, Frederick Rand, "The Case for the Elimination of the Traditional Report Card," *Education*, December, 1933, pp. 234–239.

Ruch, G. M., *The Objective or New Type Examination*, Chicago, Scott, Foresman Company, 1929, pp. 379–380.

Russell, Charles, *Classroom Tests*, Boston, Ginn and Company, 1926, pp. 269–278.

Sims, Vernon M., "The Objectivity, Reliability, and Validity of an Essay Examination Graded by Rating," *Journal of Educational Research*, Vol. XXIV (October, 1931), pp. 216–223.

Smith, E. R., "Marks and Marking," *Child Welfare*, Vol. XXVII, October, 1932, pp. 73–75.

Thorndike, Edward L., *Measuring Intelligence*, Bureau of Publications, Teachers College, Columbia University, New York City, 1926.

———, and McCall, William A., Thorndike-McCall Reading Scale, Form I, "Directions for Using," Bureau of Publications, Teachers College, Columbia University, New York City, 1921, p. 4.

Toops, Herbert A., "The Transmutation of Marks," *Ohio College Annual Bulletin*, No. 88, mimeographed ed., Columbus, Ohio.

Wakeman, G., "Humanizing Grades," *School and Society*, Vol. XXXIV (October, 1931), pp. 596–598.

Warden, K. W., "Turning the Light on Teachers' Marks," *American School Board Journal*, Vol. LXIX (October, 1924), p. 64.

General Structure and Value of Objective Tests

I. Construction Procedure

1. Forms of objective tests. There are many forms of objective tests, but practically all of these may be classified under the two general headings, *recall* and *recognition*. Recall items are those in which the student recalls from a stimulus word, phrase, question, or sentence. Recognition items are those in which the student recognizes the correct items or relations when these are given in the test (the correct items are usually mixed with incorrect items). Authorities do not agree on the names of objective forms, and it is probable that some of the names used in this book are not common to or mentioned by other writers, for example, the form "sentence completion matching." Some forms received their odd names from their mechanical design. The following sample is called *analogies*, because it measures analogous relations; but in form it is multiple choice. This form receives its name from the psychological function measured.

Man is to men as boy is to   1 cat   2 animal   3 boy's
4 women   5 boys.

Some other forms in which calculations are made may be called *computations*, but perhaps in reality these are simple recalls, or the old subjective forms scored objectively. Some writers use the name *identification* as the name of a form. Such a form is usually multiple choice or matching. Perhaps the correction of errors, as in grammar, punctuation, or capitalization (test situations where students cross out words which make statements incorrect), may be called a *redundancy* or *crossout*. The name of the objective form is not vital. The important factor to be considered is the actual value of the mechanical form in which the test items are placed. The composer should always ask himself these questions: Does this form measure the things that I want it to measure? and Does it measure these things accurately? One who asks these questions is speaking of valid-

ity and reliability. Probably this book gives the fewest names of objective forms, while Ruch[1] gives the largest list of names.

2. Steps in building an objective test. *Selection of subject-matter information or learning units.* There are two general plans for selecting items for an objective test that are practical for the classroom teacher. These plans would, perhaps, not be practical for a general, nation-wide, standardized test covering a wide range of subject matter and ability. The first plan simply requires that the teacher keep a daily record of the important items covered in a given subject, and at the end of the teaching period, when she prepares the test, that she include these items. A record of these items can be kept in two ways: first, simply by making a check mark in textbooks, course of study, and lesson plans; second, by keeping a notebook and making brief notes on the important items. This means that at the end of the teaching period the teacher samples evenly and uniformly from the items marked from the first day up to the last day of the teaching period.

The second plan is different from the one just described because the selection of test items is done just after the teaching period and a few days before the examination is to be given. In this case it is necessary for the teacher to review the whole course, textbooks, course of study, and lesson plans, and carefully sample the important factors. Some authorities recommend building a complete outline, numbering the outline, and selecting a number of items in terms of the importance of the items in the outline, thus giving important topics more questions or more test items. Such an outline is called by Ruch[2] a "Table of Specifications." This plan has been called for many years by research workers in business a "job analysis." What it is called has little to do with what the teacher does. The teacher makes a detailed outline of what is covered in the teaching and ade-quately samples this outline in terms of importance. But this outline should be done before teaching and not after teaching. The test should sample the outline of what is taught.

Selection of objective forms. Regardless of which plan is used in choice of subject matter, the second step is the choice of objective forms. Certain guiding principles have been found prac-

---

[1] Ruch, G. M., *The Objective or New Type Examination*, Chicago, Scott, Foresman Company, 1929, pp. 186–190.
[2] Ruch, *op. cit.*, 1929, p. 149.

tical and statistically valid. A test of any length or a test covering a complete section of subject-matter learning should always have several objective forms. It has been found that some students respond more readily to one objective form than another; and, therefore, to sample fairly the students' ability to respond, several objective forms should be used. It has also been found that some subject matter lends itself more readily to certain objective forms than to others. Therefore, to sample profitably all kinds of things learned in a course, several objective forms should be used. This is especially true in sampling a whole course. Table VIII shows many objective forms used for the semester's work in the course in educational measurements.

The actual process of composing test items can be carried out most efficiently by taking each subject-matter item to be tested and writing it in one of the objective forms chosen. It is wise to use separate sheets of paper for each objective form, and to call these, respectively, Exercise I, Exercise II, and so forth. In drawing up items for matching, each group must be made so that the answers within a group are of the same type or kind of answer. That is, if group A has answers which are the names of men, no other responses but the names of men should be used. If other responses, such as dates, are desired, a new group of items must be organized. As many subgroups as desired for the matching form may be drawn up. The objective form which will best measure the item should be chosen. This will prevent artificial or poor wording to make a given item of information fit a particular form.

Alternative response items present certain difficulties for young children because half of these items may be false statements, and psychologically it is unwise to present false statements to either young children or students beginning any new body of knowledge. While there is no experimental evidence, the writer believes that this form is not so valid nor reliable for either group of students just mentioned.

A principle to help the teacher decide what should constitute a test item is the following: Break up the information desired into the smallest measurable statements, or test items, and arbitrarily count each answer one point. This is much better than giving numerical values in terms of importance, for different teachers would seldom give the same value to the same question. By giving each "smallest possible measurable" item a point value of one, numerical values or weights can be statistically

determined if it is desired. Many researchers[3] definitely show, however, that weighting is not worth the labor involved.

As far as possible, arrange the test items in order of difficulty. If the first questions or items are easy, the student is encouraged and not discouraged. Highly standardized tests or scales, for certain purposes, have the test questions arranged in order of difficulty (statistically determined by the percentage of children who answer or miss each question). If the teacher later wishes to revise her objective test starting with easy questions, the difficulty of each question can be calculated and the test can be rewritten, test items being rearranged in descending order of difficulty. This method is primarily used in measuring attitude and power in general, or in specific ability tests.

Composition of directions for taking the test. The directions to the students for responding to the test must be written and stated clearly before the mechanical forms of the test items are chosen. This is obvious, for directions determine the position of responses. All directions must include two statements in the following order: First, inform the student what is given (true-false statements, some of which are false and some of which are true; a number of sentences with blanks to be completed; and so on); second, inform the student what he is to do (where and how he is to record his answers). The directions may have a third part which is always important for young children and often helpful for mature students: this is a sample of one or two items correctly answered. These samples should be very simple and should embody information well known to even the dullest students. Many standardized tests give a practice exercise so as to acquaint the student with the kind of response to be made, this practice exercise not counting in the score. After students learn objective forms, a sample correctly answered will not be necessary.

Scoring. The very heart of an objective test is the method of scoring. Often the only difference between a subjective test and an objective test is the method of scoring. Perfect objectivity exists when many people can score the same test and get

---

[3] These studies are reviewed by Lee, J. Murray, and Symonds, Percival M., in "New Type or Objective Tests: A Summary of Recent Investigations," *Journal of Educational Psychology*, Vol. XXIV (January, 1931), pp. 21–38, and Vol. XXV (March, 1934), pp. 161–184; Lindquist, E. F., and Maucker, William, "Objective Achievement Test Construction," in "Educational Tests and Their Use," *Review of Educational Research*, Vol. V (December, 1935), pp. 469–483.

exactly the same number of points. A key of answers, which must contain all possible correct answers, must also specify what is counted and how much. In objective forms where children write words, the factor of spelling must be stated in the rules for scoring. Unless it is a spelling test, spelling is usually not counted. If the teacher, however, desires to count spelling, the spelling should be marked separately and given a separate score. A better plan, however, is not to count spelling on the subject-matter information test, but to design a separate test to measure the spelling of important words.

Rapidity and ease of scoring lend to reliability; therefore, the key of answers should mechanically fit in position the student's responses on the printed or mimeographed test page. Since answers to objective tests are usually short answers, the answers to several pages or several exercises can be placed on one sheet of paper in column formation. By folding the answer columns, one can place the printed answers beside the student's answers and score the test rapidly and accurately.

As there is guessing in all forms of examinations, many efforts have been made to correct the score for guessing, principally in the true-false, as the opportunity for guessing is greatest in this form. The correction usually employed is to score right answers minus wrong answers. This formula penalizes for guessing wrongly. Ruch[4] says that it is still debatable whether this formula raises or lowers reliability, but that it does increase the validity of test scores. However, he states that if the teacher does not wish to use this formula, a 15 per cent increase in length will eliminate the need of the correction. The generalized formula for chance guessing in all items having two or more choices is:

$$\text{Score} = \text{Right} - \frac{\text{Wrong}}{\text{Number of Responses} - 1}.$$

In other objective forms it is seldom employed except in certain intelligence tests. In measuring achievement, the formula will not be necessary if the test is lengthened.

Sample of scoring key. Below is presented a sample key of answers for the first few items of five exercises, each exercise covering one page. Under Exercise V a bar is placed by items five and six, because these two answers are connected in the

---

[4] Ruch, *op. cit.*, 1929, p. 356.

test by the word *and*, and their order is not important; that is, the first word may be *annual* or the first word may be *perennial*. It is also noticed that spelling is not counted in scoring Exercise V.

SAMPLE KEY

Directions. Fold this sheet on the long vertical lines and place the key of answers by the pupil's answers for easy scoring. Do not count correct any answer other than the ones given in the key.

The maximum score for each exercise is given. Each numbered answer gets *one point*. Maximum score for test is 118 points.

In the completion answers, spelling is disregarded unless the spelling makes the response wrong as judged by subject matter. The vertical bar indicates that the order of the two responses is not essential.

EXERCISE I		EXERCISE II		EXERCISE III		EXERCISE IV		EXERCISE V	
Q.	*Ans.*	*Q.*	*Ans.*	*Q.*	*Ans.*	*Q.*	*Ans.*	*Q.*	*Ans.*
1	T	1	213.3	1	2	1	3	1	sheep
2	F	2	40	2	3	2	2	2	44
3	F	3	.1	3	1	3	5	3	8
4	F	4	9.76	4	4	4	8	4	1930
5	T	5	20	5	1	5	9	5	perennial
6	T	6	9.1	6	5	6	12	6	annual
7	F	7	16	7	3	7	10	7	Babcock
etc.		*etc.*		*etc.*		*etc.*		*etc.*	
Score: R − W		Score: No. R.		Score: No. R.		Score: No. R.		Score: No. R.	
Max. Score: 34		Max. Score: 26		Max. Score: 24		Max. Score: 15		Max. Score: 19	

A convenient form of a key of answers prepared so that each answer will mechanically match the question has been used by Rinsland[5] in the Rinsland-Tracy Teaching Tests for Oklahoma and Kansas. This device also furnishes a key of answers for each child. In the sample given below it will be noticed that the key contains references to pages. These are the pages in the textbook, as the Language-Grammar Test illustrated is based on the state-adopted text.

[5] Rinsland, Henry D., *op. cit.*, 1936 (used by special permission of the publishers).

Henry D. Rinsland, Editor
University of Oklahoma

Published by
Dodsworth School Supply
Kansas City, Mo.

RINSLAND-TRACY TEACHING
TESTS
(For Oklahoma)

Language-
Grammar

Name_____School_____
Score_____Grade_____

LANGUAGE-GRAMMAR
by Roland L. Beck and Betty S. Beck

PART I

KEY
Score is number
correct.

1ST SIX WEEKS   GRADE 7

DIRECTIONS: Below is given a number of statements each followed by five words or phrases, only one of which is correct. Find the one that completes the statement and makes it true, and place its number in the parentheses in front of the statement.

Page	Q.	Ans.

1 ( ) A narrative has   1 one part   2 two parts   3 three parts   4 four parts   5 five parts.

2 ( ) The climax is the point in the story   1 of falling interest   2 of least interest   3 of no interest   4 of rising interest   5 of greatest interest.

3 ( ) The setting of a story is   1 the time and place and characters   2 the time only   3 the place only   4 the placing of the chapters   5 the characters in the story.

4 ( ) The parts of a story are   1 beginning, middle, and ending   2 suspense and climax   3 setting, plot, and ending   4 climax and catastrophe   5 rising action and falling action.

Page	Q.	Ans.
[1]	1	3
[6]	2	5
[2]	3	1
[2-3]	4	3

Cut off this key on this line before giving test to pupil

1ST SIX WEEKS	GRADE 7	Page	Q.	Ans.

5 ( ) The setting and conclusion of a story should be   1 long   2 of medium length   3 most of the story   4 short   5 the longest.   [6-7]   5   4

6 ( ) The plot is made up of the   1 time and place   2 happenings that develop suspense   3 conclusion   4 beginning and ending   5 middle and conclusion.   [4]   6   2

7 ( ) We use punctuation   1 to mark breathing places   2 to make the sentence look better   3 to make the meaning clear   4 to indicate rise and fall of the voice   5 to denote pauses.   [10]   7   3

8 ( ) A paragraph is a   1 grading scale   2 place to stop   3 group of sentences on many subjects   4 group of sentences on one subject   5 place where the reading is broken.   [10-11]   8   4

9 ( ) A topic sentence gives   1 the details of a paragraph   2 a contrast   3 a comparison   4 a definition   5 the main point of the paragraph.   [10]   9   5

10 ( ) Members of a series of words or phrases must be separated by   1 commas   2 semicolons   3 periods   4 dashes   5 colons.   [17]   10   1

11 ( ) The comma is used   1 before the series   2 after the series   3 between the last two members of the series as well as between the others   4 when conjunctions are used before all the members of the series   5 before and after the series.   [17]   11   3

12 ( ) When conjunctions are used between the members of a series, use   1 commas   2 dashes   3 colons   4 no commas   5 semicolons.   [17]   12   4

Cut off this key on this line before giving test to pupil

1ST SIX WEEKS	GRADE 7	Page	Q.	Ans.

13 (   ) Correct pronunciation can be learned best by   1 imitation   2 practice inside and outside of class   3 practice in class   4 no practice   5 just a little practice. — [19] 13 — 2

14 (   ) A synonym for "said" is   1 reciprocated   2 immersed   3 replied   4 staggered   5 permeated. — [4] 14 — 3

15 (   ) The climax of a story should come   1 at the beginning   2 in the middle   3 at the end   4 just after the introduction   5 just before the body of the story. — [6] 15 — 3

16 (   ) The opposite of "vivid" is   1 brilliant   2 intense   3 clear   4 vigorous   5 dull. — [17] 16 — 5

17 (   ) In grammar the different kinds of words are called   1 antonyms   2 parts of speech   3 synonyms   4 prefixes   5 suffixes. — [26] 17 — 2

18 (   ) Proper nouns should begin with   1 a prefix   2 a long syllable   3 an apostrophe   4 a capital   5 a suffix. — [26] 18 — 4

19 (   ) Subheadings in outlines should be indented   1 one-half inch   2 one inch   3 two inches   4 four inches   5 eight inches. — [24] 19 — 1

20 (   ) The outline of a story should regularly have   1 one   2 two   3 three   4 four   5 ten main divisions. — [23] 20 — 3

Cut off this key on this line before giving test to pupil

LANGUAGE-GRAMMAR

PART II

1ST SIX WEEKS   GRADE 7

DIRECTIONS: In each of the sentences below one or more words are needed in the numbered blank spaces to make the sentences complete and true.   Place the word or words in the correspondingly numbered blank to the right.   In some cases additional suggestions to help you fill in the blanks are found in parentheses beneath the numbered blank.

21 (21) are words that(_____)21 have the same meaning.

22 The (22) of a story(_____)22 gives the setting.

23 The members of a(_____)23 (23) of words or phrases must be separated from each other by commas.

24 Did you think it was(_____)24 J a m e s ?   Y e s , I thought it was (24).
        (pronoun)

25 They were not our(_____)25 friends, but our (25).

26 The closing of a story(_____)26 is called the (26).

27 When you are asked(_____)27 over the telephone, "Is this 'so-and-so'?", you should answer, "Yes, this is (27)."

28 The word "girl" is a(_____)28 (28) noun.

29 The word "honesty"(_____)29 is a(n) (29) noun.

30 The word "crowd" is(_____)30 a(n) (30) noun.

Language-Grammar

KEY
Score is number correct.   Do   not count spelling except when   spelling   is tested.

Page	Q.	Ans.
[4]	21	Syno-nyms
[2]	22	intro-duction
[17]	23	series
[19]	24	he
[19]	25	enemies
[4]	26	con-clusion
[8]	27	he or she
[26]	28	common
[28]	29	abstract
[27]	30	collective

Cut off this key on this line before giving test to pupil

1ST SIX WEEKS	GRADE 7	Page	Q.	Ans.
31 The letters "a," "e,"(_____)31 "i," "o," and "u" are called (31).		[30]	31	vowels
32 "Children" is a noun(_____)32 which is (32) in number.		[30]	32	plural
33 The plural of the word(_____)33 "cod" is (33).		[31]	33	cod
34 The plural of the word(_____)34 "cargo" is (34).		[31]	34	cargoes
35 The plural of the word(_____)35 "cupful" is (35).		[32]	35	cupfuls
36 In outlines the first(_____)36 word of each heading should begin with a (36).		[24]	36	capital
37 In outlines you should(_____)37 (37) letters and figures for headings and subdivisions.		[24]	37	alternate
38 Collective nouns re-(_____)38 quire verbs that are (38) in number.		[27]	38	singular
39 The point of greatest(_____)39 interest in a story is called the (39).		[6]	39	climax
40 To tell the (40) of(_____)40 a word is to tell whether a word stands for one or more than one object.		[29]	40	number

Cut off this key on this line before giving test to pupil

Several samples of miscellaneous tests in Chapter VII have keys which indicate their position on the test paper. Many mechanical arrangements are possible. The teacher should experiment with these rapid scoring devices, but rapidity of scoring does not precede validity in testing. Tests should not be built to be scored quickly. Validity should be attained first. Many rapid scoring devices have been reported and invented, some costing over a hundred dollars. The writer, since 1928, has been using and experimenting with a Universal Test Response

Sheet and a Universal Response Test Scoring Key which are adaptable to any form of alternative test, any form of multiple choice up to five choices, or any form of matching up to 55 items. Students cross out the number 1, 2, 3, 4, or 5 on the answer sheet. The key is a perforated folder through which can be seen the correctly crossed out number 1, 2, 3, 4, or 5.

Timing the test. The earlier standardized tests were timed because the builders believed that speed was a very desirable factor to measure. This is no longer universally held to be so important. Even in arithmetic, the insistence on speed for little children is very often a serious pedagogical blunder. Speed in arithmetic calculation is a vocational requirement and varies from one vocation to another. The clerk in a grocery store who has to add ten items on a grocery slip is not required to add a given number of such sales slips in a limited time. The bookkeeper who adds all the sales slips for each customer's account at the end of the month is probably furnished an adding machine, and he may not be able to add so quickly without an adding machine as the individual clerks. Of course, statisticians, engineers, and specialists in different occupations must be able to calculate rapidly. Skilled teachers are almost unanimous in condemning the overemphasis of speed for children. It is important that for a monthly or semester grade speed be reduced to a minimum. In certain aptitude or ability tests it is obvious that speed is one of the factors. The best principle to follow in regard to speed is to give as much time as is necessary for *nearly all* children to finish.

The teacher should try to determine the amount of reading and responding that children can do within a given test period, and the result should determine the number of test items for that test period. If it is found that the test period is too short to measure completely and deliberately all important items, the test period should be lengthened, or another test period should be added and the test divided into two parts. As objective tests cover many more items in a given period of time than do subjective tests, most teachers will find that the period of time devoted to subjective tests is ample for longer, more diagnostic objective tests.

II. Reliability

A test is perfectly reliable when an infinite number of equivalent forms of the same test given to the same group of subjects

will yield identical scores for all subjects. Reliability is consistency in securing an accurate score. As a matter of fact, the word *accuracy* can be substituted in a general way for the word *reliability*.

1. Factors contributing to reliability. *a. Consistency and clearness of the test items, statements, or questions.* It is impossible to have a reliable test if the individual items making up the test are not in themselves reliable. Ambiguous and misleading statements and any structure of English or any mechanical structure of the test that misleads students will lower the reliability of the test. Rules for constructing reliable test items are given in Chapters II to VII, and if followed should yield reliable scores.

b. Sampling. It is perfectly obvious that 10 questions are not so reliable as 100 questions. Survey tests use a few items for measuring a wide range of ability (such as tests with 10 questions in arithmetic to measure reasoning ability from Grades III to VIII). Diagnostic tests designed to measure all kinds of reasoning abilities from Grades III to VIII would be very much longer. If the test items in both survey and diagnostic tests are equally well worded, the diagnostic test would be the more reliable of the two. Other things being equal, lengthening a test is always a sure way of increasing reliability. Any device that secures more responses per unit of time raises reliability. Test items with short answers are more reliable than those requiring long answers.

c. Other factors influencing reliability. Symonds[6] gives a very complete treatise on the many factors influencing reliability. He suggests a number which the teacher should consider. Chance plays an important part, especially in true-false forms, where the opportunity for guessing is greatest. Cheating, as all know, lowers reliability. The more homogeneous the material tested, the higher the reliability. Test items which are answered by about 50 per cent of students have the greatest reliability in tests covering a range of abilities within one grade. The accuracy of the student affects the reliability of the test, and the accuracy of students varies greatly. Slight illness and excitement do not affect reliability so much as is usually believed. Many of the factors mentioned by Symonds are

---

[6] Symonds, Percival M., "Factors Influencing Test Reliabilities," *Journal of Educational Psychology*, Vol. XIX (February, 1928), pp. 73–87.

treated in the rules for building objective tests in Chapters II to VII.

2. **Method of calculating reliability.** The establishment of reliability is a comparatively simple statistical device and is done by calculating the coefficient of correlation between two divisions of the same test. When the coefficient of correlation is used as a numerical value of reliability, it is called the *coefficient of reliability*. Before the several ways of securing a coefficient of reliability are explained, it is necessary to understand both the meaning and the calculation of the coefficient of correlation.

a. *The coefficient of correlation* (r). Mathematicians often resort to very simple devices to explain their ideas numerically. These ideas are often based upon a large group of assumptions, many of which may be theoretical and philosophical; but, once the assumptions are admitted, we all arrive at the same formula. This device is one of the greatest contributions of mathematicians. It is the most perfect form of logical reasoning invented by the human mind.

Mathematicians have simply set the number 1.00 as the numerical expression of perfect relation between two measures. These measures are often called *variables*, because the measures vary from one individual to another. This is a well-known fact to everyone who sees that individuals do vary in stature, weight, intelligence, and learning. When the two variables go perfectly "hand in hand"—that is, when the person highest in one variable is also highest in another, the person lowest in one variable is also lowest in another, and each individual has the same position in both variables—we say that the correlation (r) is perfect and positive, or +1.00. But if the opposite conditions are found—that is, if the person highest in one variable is lowest in the other variable, and each person has exactly the position in the second variable opposite to his position in the first variable—we say the correlation is perfect and negative, or −1.00. It is obvious that if there is no relation between the two variables, or their relation is what we would get by pure guessing, the coefficient of correlation is 0.

The correlation of scores may be thought of as an average of the products of scores when the scores are in comparable units. A comparable unit, as already learned, is a standard score; but in correlating two sets of scores, there will be two sets of standard scores, d_x/σ_x and d_y/σ_y. The subscripts x and y are used to distinguish the variables. *Correlation* may be defined

as the mean of the product of standard scores, and the formula is:

$$r_{xy} = \frac{\Sigma\left(\frac{d_x}{\sigma_x} \times \frac{d_y}{\sigma_y}\right)}{N}$$

The student has previously learned that a mean is a sum of scores divided by the number of scores. If raw scores have been converted into standard scores, it is necessary only to multiply the x and y standard scores for each student, summate the products, and divide by the number of cases.

While the standard score is used in grading, it is not necessary in correlation, for the formula for r, usually, is written:

$$r_{xy} = \frac{\Sigma d_x d_y}{N\sigma_x\sigma_y}$$

A shorter form of the same formula that is often used when it is not necessary to calculate the two standard deviations is:

$$r_{xy} = \frac{\Sigma d_x d_y}{\sqrt{\Sigma(d_x)^2 \times \Sigma(d_y)^2}}$$

In this form there are to be determined two statistical units which have already been learned, the means and the standard deviations. One more step is necessary to compute r, and that is to multiply the deviations and place the sum of these products in the above formula. Then the fraction is cleared.

In Table IX are two sets of scores for the same 20 children on an objective test. These scores are the scores on even-numbered and odd-numbered questions of the same test. The arithmetical mean for both X and Y are first calculated. Then each score is subtracted from its respective mean, and the results are entered in the columns headed d_x and d_y. To calculate the sigmas, it is necessary (as in Tables I and II) to square the d's and summate the d_x and d_y columns, divide by N, and extract the square roots.

The only new column to learn to calculate is $d_x d_y$, which is simply the result of multiplying d_x by d_y. The column $d_x d_y$ is then added, and this sum becomes the term $d_x d_y$, which is the numerator of the formula. The denominator is simply the product of N times the sigmas. The numerator is divided by the denominator, and the quotient is the coefficient of correlation.

Table IX

ORIGINAL SCORES ON EVEN- AND ODD-NUMBERED ITEMS OF AN
OBJECTIVE TEST AND THE CALCULATIONS FOR THE
COEFFICIENT OF CORRELATION

	Original Data		Calculated Data				
Case	Score on Even Items X	Score on Odd Items Y	d_x	d_y	d^2_x	d^2_y	$d_x d_y$
1	3	4	− 8	−7	64	49	56
2	18	17	7	6	49	36	42
3	7	7	− 4	−4	16	16	16
4	5	4	− 6	−7	36	49	42
5	10	12	− 1	1	1	1	− 1
6	12	14	1	3	1	9	3
7	1	3	−10	−8	100	64	80
8	10	8	− 1	−3	1	9	3
9	16	17	5	6	25	36	30
10	13	11	2	0	4	0	0
11	15	17	4	6	16	36	24
12	17	16	6	5	36	25	30
13	8	9	− 3	−2	9	4	6
14	11	10	0	−1	0	1	0
15	17	15	6	4	36	16	24
16	3	2	− 8	−9	64	81	72
17	9	9	− 2	−2	4	4	4
18	19	20	8	9	64	81	72
19	11	12	0	1	0	1	0
20	8	11	− 3	0	9	0	0

$N = 20$ $\Sigma X = 213$ $\Sigma Y = 218$

$$\Sigma d^2_x = 535 \qquad \Sigma d^2_y = 518 \qquad \begin{array}{r} -\ 1 \\ +504 \end{array}$$

$$\Sigma d_x d_y = 503$$

Calculation of means:

$$M_x = \frac{\Sigma X}{N}$$

$$= \tfrac{213}{20}$$

$$= 10.6$$

or $M_x = 11$, approximately.

$$M_y = \frac{\Sigma Y}{N}$$

$$= \tfrac{218}{20}$$

$$= 10.9$$

or $M_y = 11$, approximately.

Calculation of σ's:

$$\sigma_x = \sqrt{\frac{\Sigma d^2_x}{N}}$$

$$= \sqrt{\tfrac{535}{20}}$$

$$= \sqrt{26\ 75}$$

$$\sigma_x = 5.1.$$

$$\sigma_y = \sqrt{\frac{\Sigma d^2_y}{N}}$$

$$= \sqrt{\tfrac{518}{20}}$$

$$= \sqrt{25.90}$$

$$\sigma_y = 5.1.$$

Calculation of r:

$$r_{xy} = \frac{\Sigma d_x d_y}{N \sigma_x \sigma_y}$$

$$= \frac{503}{20 \times 5.1 \times 5.1}$$

$$= \frac{503}{520.2}$$

$$= 966$$

or $r_{xy} = .97$, approximately.

The correlation of even and odd scores in the above problem is .97, but this is the correlation of a test with itself, where the length of the test in the correlation problem is one-half that of the test that was given. The above test had 40 questions. Now, since length of test affects reliability, the reliability of the complete test is higher than the reliability of the scores of the two halves calculated. Reliability must be calculated by a formula known as the Brown-Spearman "prophecy" formula, which is:

$$r_{12} = \frac{nr_{xy}}{1 + (n - 1)r_{xy}}$$

where r_{xy} is the calculated correlation between chance halves, n is the number of times longer the used test is than the parts correlated (in the above case, this is 2), and r_{12} is the correlation which would be expected between the complete examination given and another hypothetical examination of the same length. The coefficient of reliability is r_{12} and not r_{xy}.

Substituting data from Table IX,

$$r_{12} = \frac{2 \times .97}{1 + (2 - 1).97}$$
$$= .984$$

or $\qquad r_{12} = .98$, approximately.

This is the reliability of the whole test as given. It is, however, much higher than is usually obtained, but the original data are from a measurement of unusually high objectivity.

b. *Errors of r.* There is an error of r due to sampling, and it is defined in terms of the fluctuation of r so many times out of 100. When the fluctuation of r varies above and below the obtained r 50 times out of 100, the error is called a *probable error*, abbreviated *P.E.* When the fluctuation is expressed in terms of $\pm 1\sigma$, the error is called a *standard error* and is the fluctuation of r 68 times out of 100. It is written σ_r. Just as σ is a measure on the base line of a normal curve, so *P.E.* is a measure on the base line of the normal curve, but is a shorter measure; and plus and minus 1 *P.E.* set off, above and below the mean, 50 per cent of all cases. Plus and minus one sigma set off 68.26 per cent of all cases. These variabilities are both used as concepts of an error indicating variations due to sampling.

The formula for a standard error of r is:

$$\sigma_r = \frac{1 - r^2}{\sqrt{N}}$$

and the formula for probable error of r is:

$$P.E._r = .6745\frac{1 - r^2}{\sqrt{N}}$$

The constant .6745 is the size of $P.E.$ relative to σ, as $P.E.$ is only .6745 as large as σ.

In the problem just calculated, the coefficient of reliability is .98 and N is 20; therefore, the standard error of r is:

$$\sigma_r = \frac{1.00 - (.98)^2}{\sqrt{20}}$$
$$= .009$$

and the probable error of r is:

$$P.E._r = .6745\frac{1.00 - (.98)^2}{\sqrt{20}}$$
$$= .006$$

These errors are seldom significant beyond the second or third decimal. The coefficients of correlation below .90 seldom require more than two decimals for significance, and those correlations above .90 are usually written with three decimals, especially where there are a fairly large number of cases (over 100).

The standard error of $\pm.009$ means that the obtained r of .98 will fluctuate 68 times out of a hundred $\pm.009$, or that the true r is probably between .971 and .989. The probable error of $\pm.006$ means that the obtained r of .98 will fluctuate 50 times out of 100 $\pm.006$, or that the true r is probably between .974 and .986.

3. Coefficient of alienation and its use in prediction. The coefficient of correlation and its errors due to sampling are what mathematicians call *pure numbers* and are hard to define. A method of showing the meaning of r is through another coefficient—the coefficient of alienation (k). We may represent the range of correlation from -1.00 through 0 to $+1.00$ by a straight line. Correlation involves a concept of prediction.

A coefficient of correlation of one means that one score can be predicted from another perfectly. An r of zero means that there is no prediction better than a pure guess. It is possible to explain the meaning of an r by stating that a given r will predict a certain percentage better than predicting the average, or mean. The average is usually considered the best guess, as there are more cases closer to the average than to any other score. To calculate this prediction, we must first calculate the coefficient of alienation and then subtract this from one. If we say that the coefficient of correlation expresses the degree of agreement, we may have a coefficient of alienation to express the degree of disagreement. This coefficient is the opposite of a coefficient of correlation (r). Therefore, an r of $+1.00$ or -1.00 will be equal to k of 0, and an r of 0 will be equal to a k of 1.00. This is illustrated in Figure 6:

Coefficients of Correlation (r)

-1.00	$-.866$	0	$+.866$	$+1.00$
0	$.50$	1	$.50$	0

Coefficients of Alienation (k)
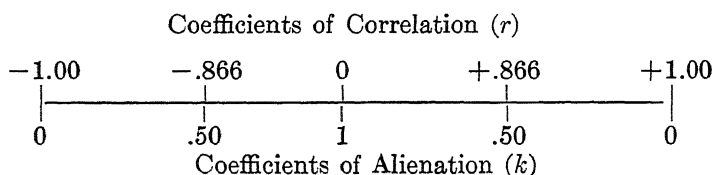
Fig. 6. A Linear Interpretation of the Meaning of the Coefficient of Correlation Illustrated by Comparing Five r's (-1.00, $-.866$, 0, $+.866$, and $+1.00$) with Their Corresponding Coefficients of Alienation.

It will be noticed that a k of .50 is halfway from the ends of the line to the middle, and that r is .866. Units of k are truly equal in steps on a straight line. This can be readily seen when the formula for k is written:

$$k = \sqrt{1 - r^2}.$$

Substituting .866 for r in the formula and calculating,

$$k = \sqrt{1 - (.866)^2}$$
$$= \sqrt{1 - .7499}$$
$$= \sqrt{.2500}$$

or

$$k = .50.$$

We can now say that a correlation of .866 is just half as good as the correlation of 1.00 and twice as good as the correlation of zero; or when we have a correlation of .866, we can predict one variable from the other 50 per cent better than we

can guess the mean. This prediction is expressed by $1.00 - k$. Taking a higher correlation, say .95, we find $k = .312$ and $1.00 - k = .687$, or approximately 69 per cent better than we can guess the mean. An r of .98 gives a k of .199, or approximately .20; and $1.00 - k = .80$, or 80 per cent better than guessing. This merely shows that high correlations, or high degrees of accuracy in predicting one variable from another, can be present only when we have correlations that are around .90 or above.

When a coefficient of correlation is interpreted as a coefficient of reliability of a test, we do not have a very reliable test unless our coefficients are around .90 to .98. Such high coefficients are seldom obtained by very short or survey tests. They can be obtained only by long, comprehensive, thoroughly diagnostic tests. It is claimed by Kelley[7] that a test with a one-grade range, to be diagnostic, that is, to be so reliable that one can accurately count on a score for an individual pupil, must have a coefficient of reliability of .94. This is so uniformly accepted by measurement authorities that one of the definitions of a diagnostic test is the requirement of a coefficient of reliability of about .94.

4. Errors of a raw or original score. If reliability of a test can be explained in terms of the fluctuation of an obtained score from the probable true score (a score that might be obtained if we could give an infinite number of tests and averaged the scores), we have a much more tangible unit of error. The standard error of a score and the probable error of a score are each such a unit. Logically, one can see that two things affect the error of a score: the coefficient of reliability itself and the opportunity for fluctuation of a score in a distribution. The latter is the range or width of the distribution. Statisticians, however, seldom use the whole range, because the lowest and highest scores are unreliable (the sampling at the ends being poor); so they use the sigma or probable error range. The formulas for the standard error of a score and the $P.E.$ of a score are:

$$\sigma_{(Score)} = \sigma\sqrt{1 - r}$$
$$P.E._{(Score)} = .6745\sigma\sqrt{1 - r}$$

In the problem just calculated, we have two sigmas for two

[7] Kelley, Truman L., *Interpretation of Educational Measurements*, Yonkers-on-Hudson, N. Y., World Book Company, 1927, pp. 210–211.

parts of the test; so the sigma of the whole test must be the average of these two, 11.7 or $\left(\dfrac{11.6 - 11.9}{2}\right)$. Now, r is .98. Therefore,

$$\sigma_{(Score)} = 11.7\sqrt{1 - .98}$$
$$= 1.65$$

or

$$\sigma_{(Score)} = 2, \text{ approximately;}$$

and

$$P.E._{(Score)} = .6745 \times 1.65$$
$$= 1.10$$

or

$$P.E._{(Score)} = 1, \text{ approximately.}$$

The meaning of the standard error of a score on this test is that the chances are 68 out of 100 that an obtained score will be within 2 points, plus or minus, of the true score. The probable error of a score means that the chances are 50 out of 100 that an obtained score will be within 1 point, plus or minus, of the true score. If a pupil on this test makes a score of 35, his true score is between 33 and 37 (35 ± 2) sixty-eight times out of 100, or his true score is between 34 and 36 (35 ± 1) fifty times out of 100.

From the recent catalogs of standardized tests and recent books on standardized tests, one sees an increase in the use of these errors of raw scores. They are more practical in explaining the probable or likely fluctuation of scores as the latter are affected by variability and reliability. They show the amount of confidence which may be placed in a score.

To compare these errors of different tests, where the reliabilities may be the same or different and the standard deviations may be the same or different, one has only to divide the standard error of a score by the standard deviation of the distribution. This will equate the reliabilities of tests just as the standard score equated scores of tests by dividing deviations by standard deviation. The term which might be applied to this division or ratio is *ratio of reliability*, or R_r, and the formula[8] would be:

$$R_r = \frac{\sigma_{(Score)}}{\sigma}.$$

[8] Symonds, Percival M., *Measurements in Secondary Education*, New York, The Macmillan Company, 1927, pp. 566–567. Symonds suggests this ratio but does not give it a name or use the symbol given here.

This formula places a perfectly reliable test at a ratio of reliability of zero and a perfectly unreliable test at a ratio of reliability of 1.00; that is, the limits are just the opposite of those of the coefficient of reliability. One can compare his tests with each other and his tests with standardized tests in reliability. This unit is becoming more widely used in standardized tests and in books about the use of standardized tests.

5. Other methods of determining reliability. There are two other methods of determining the reliability of a test, but the same formula or calculation of the coefficient of correlation is used, although the Brown-Spearman "prophecy" formula is not used. A test may be given to the same students twice and the scores correlated. Of course, there will be improvement in the second scores, but what is calculated is the degree of agreement of the two sets of scores. Two equivalent forms of a test may be made and both forms given to the same students and these scores correlated. The latter plan is almost always employed in well-standardized tests. It requires that two tests must be made as nearly equivalent as possible. Equivalence may be said to exist when the two averages, the two sigmas, and the two reliabilities (calculating the correlation of even and odd items) and validities are the same.

6. Standardization of objective tests. The statistical procedures described give the teacher an opportunity to standardize a test statistically within a range of one grade. Norms will be standard scores, R scores, mean, and standard deviation. Reliability and validity of the test will be known. This is more than many standardized tests give. Most standardized tests are so called because the scores of large numbers of children have been averaged grade by grade or age by age to obtain what is called *norms*—grade or age averages. Norms are but averages of defined groups, or the scores of one group converted into some kind of comparable units as standard scores. Many standardized tests are designed to measure abilities covering a range of several grades. Grade and age norms are therefore needed. Of course, teachers can design tests to cover several ranges of abilities. Then grade and age norms can be determined for a given school. Tests made for one school give no scores with which to compare that school with schools in general. Such information is primarily useful for administrative officers rather than classroom teachers. There has been an overemphasis on nation-wide standards. Most value will ultimately

come from diagnostic tests designed to measure in great detail and with a high degree of accuracy the learnings of individual pupils. The short survey tests have historical prestige and cost less than long, detailed tests which take more paper and printing. Yet thousands of dollars are wasted annually for survey tests with little or no benefit to teachers or pupils.

Other main characteristics of standardized tests are their broad sampling of subject matter and the great care with which the subject matter is chosen. Standardized tests demand a much more critical analysis of subject matter, greater care in mechanical form, and more exacting statistical refinements than the teacher's own tests used in local situations. The mere publication of a set of norms does not make an objective test standardized, although this is the only claim for standardization which may be ascribed to hundreds of so-called standardized tests. In a number of subjects, a broad sampling of elements in the test is much better than a narrow sampling by the classroom teacher. This would occur in such subjects as reading and language usage, because reading material is much broader than textbooks, and a great deal of usage is known by all children in all parts of the country before they start with a textbook of grammar. However, in other subjects, such as grammar, arithmetic, and spelling, validity depends on an accurate sampling of what children have studied. In the activity projects, or in creative schools where children choose problems or projects, the teacher-made objective test is vastly superior to most general tests. No teaching procedure would be comprehensive without both kinds of tests.

Teachers should standardize their own tests, guard used copies carefully by numbering each copy, and should use them several times. Ideas for improvements will accumulate, and the tests may be revised. A central testing bureau or research department could standardize its own diagnostic school-wide tests and in many cases have tests superior to published standardized tests.

III. Validity

A test is perfectly valid when it measures exactly what it aims or purports to measure. Validity is easy to define but very difficult to establish and prove either psychologically or statistically. The difficulty is in securing a reliable criterion that will be accepted by competent judges. Often validity depends

upon educational philosophy, or aims and objectives. It is the first important fact about any test. Usually, validity of achievement tests based on what children study is fairly simple and easily secured by careful study of the content of courses. There are three well-recognized kinds of validity: curricula, psychological, and statistical.

1. Curricula validity. Curricula validity is established by choosing elements of a test which are important, vital, and adequately sampled from the curricula studied by the persons whom the test intends to measure. A classroom teacher in building a valid test must sample everything that has been covered in the course. This, of course, includes textbooks, reference material, reports that have been given in class, and any activity participated in by the class as a whole. If a group of teachers make up a test, they must sample elements that all teachers have taught. Too often standardized tests made up by sampling certain textbooks do not include the textbooks used in specific schools; and as textbooks often vary greatly in content, such tests are invalid to the degree in which they do not sample the materials to which children have been exposed. An illustration of this is the disagreement in spelling words in the Stanford Achievement Test[9] and the state-adopted textbook in Oklahoma during the year 1932–1933.[10] Form V of this test has 43 words out of the total of 108 which are not in the state text. Of course, children learn to spell words outside those of the state text, but it is doubtful if many elementary children learn many such words as: *abscess, chancellor, covenant, dissension, franchise, knave, peasants, phrenologist, plebiscite, rheostat,* and *seismograph.* Such a list of words is not, under normal conditions, what children learn in elementary school. However, a few very bright children in the elementary school probably learn these words. This test, then, is not a valid diagnostic test for children using the above text, but may be a valid test to measure the total range of spelling ability of a large number of elementary children in the United States. The authors of this test never meant this to be a diagnostic test for individual pupils. For the validity of materials widely used throughout a nation, teachers should resort to very compre-

[9] Terman, L. M., Ruch, G. M., and Kelley, T. L., The New Stanford Achievement Test (Form V), Yonkers-on-Hudson, N.Y., World Book Company, 1929.

[10] Horn, Ernest, and Ashbaugh, Ernest J., *Fundamentals of Spelling,* Philadelphia, J. B. Lippincott Company, 1928.

hensive surveys of usage or practice. This was done by Rinsland and Beck[11] in determining the most valid forms of English usage to embody in an English usage test. However, the classroom teacher should properly sample what she teaches. Her tests are often more valid than even well-standardized published tests for this reason.

2. **Psychological validity.** Psychological validity is a measure of the psychological nature of the responses that students make in taking a test. If the responses are not exactly what the teacher wants to measure, then the test is to that degree invalid. The best illustration of this is found in what are often called English usage tests. Examining these tests, we find that the student is instructed as follows:

Directions. *A.* Select the correct form of the verb in the sentences below and mark out the incorrect word.

1. Will you please (*sit, set*) the book on the table?
2. Why not (*lay, lie*) down?

Directions. *B.* There are certain errors in the following sentences. Cross out the errors and write the correction over the wrong word.

1. I taken two years of high school algebra.
2. I seen him yesterday.

In *A* the student actually selects a word from someone else's composition and does no composing. In *B* the student finds errors in someone else's composition; this is proofreading. Psychologically these responses are not the same as a student's own composition. They are not valid tests of usage or composition but are valid tests of selecting a correct word or of proofreading composition. Statistically they correlate only slightly.[12]

If quality of handwriting enters into measurement of composition, geometry, spelling, or the other subjects, the element of handwriting invalidates the tests to that degree. In measuring

[11] Rinsland, Henry D., and Beck, Roland L., Natural Test of English Usage, *Teacher's Manual*, Bloomington, Ill., Public School Publishing Company, 1934, pp. 3–4.

[12] The writer in 1928 presented before the American Educational Research Association a paper in mimeograph form in which a number of correlations were given. He correlated errors per hundred running words and scores on tests similar to those illustrated in *A* and *B* in the preceding paragraph. His correlation of errors in capitalization with scores on capitalization tests is .81 ± .021; his correlation of errors in punctuation with scores on punctuation tests is .68 ± .033; his correlation of errors in grammatical structure with scores on grammatical structure tests is .78 ± .028; his correlation of errors in commas with scores on the comma tests is only .46 ± .049. The coefficients of reliability of these tests were high: capitalization, .93 ± .008; punctuation, .84 ± .018; and grammatical structure, .90 ± .011.

information in geography, history, or science by the use of recall tests, students may be given separate scores on information and spelling. If this is done, it is possible for a student to make a high score in information and a low score in spelling. In fact, these methods will have more to do with getting pure measures for these factors than anything a teacher can do. (Purity of measure and validity of measure are closely related.) It is perfectly obvious that if a child varies in these factors and the teacher gives a "sort of average" grade, the grade is like hash. No one knows just what is in it or in what proportion. If, however, each factor gets a numerical value or score, it can later be weighted and averaged arithmetically.

3. Statistical validity. Statistical validity is expressed by the correlation of a test with a criterion. The difficulty comes in selecting a reliable and acceptable criterion. Sometimes we correlate a test with other valid and reliable tests in the same field. Sometimes the criterion is the pooled opinion of teachers or school marks, but here the correlation depends on the accuracy of grades. Once a criterion is selected and expressed in numerical quantity, it can be correlated with test scores. If the correlation is high, the test is highly valid. Since validity is limited by the reliability of the criterion, we cannot expect high validity with teachers' grades when these have a reliability of only .60. This is about the median or average reliability of subjective examinations.[13]

The validity of tests of intelligence, specific abilities, and concomitant learnings (attitudes, citizenship, personality, and character) is often extremely intricate and difficult to establish, especially statistically. It should not be thought that these are unimportant because they are not treated in detail in this text. They are often more important than subject-matter learning in the general sense. The fact is that the student completing this book is just beginning to prepare himself for such adventures in validation.

There are many ways of establishing statistical validity, depending largely upon the nature of the subject matter. When words are considered in spelling or reading, the frequency

---

[13] Ruch, *op. cit.*, 1929, p. 107, gives the median reliability of 285 subjective or essay examinations as .59, while Monroe, W. S., DeVoss, J. C., and Kelly, F. J., in *Educational Tests and Measurements*, Boston, Houghton Mifflin Company, 1924, p. 471, give the median reliability of 66 essay examinations as .65.

placement of words by the *Teacher's Word Book*[14] or other similar studies is found very useful. Lentz, Hershstein, and Finch,[15] Lindquist and Cook,[16] and Lindquist and Anderson[17] have presented and evaluated a number of methods of determining statistical validity. These often include statistical methods, such as bi-serial correlation and other higher forms of correlation, and are more often used in highly standardized tests than in teachers' classroom tests.

However, Lindquist and Cook,[18] experimenting with five types of validation, recommend what they call an "index B," which involves a very simple calculation. The formula is:

$$\text{Index } B = \frac{U - L}{75},$$

where U is the percentage of correct items in the upper one-fourth of the group and L is the percentage of the correct items in the lower one-fourth of the group. They apply this formula to spelling, but it could be used by the teacher for other subjects. However, the statistical concept of validation that these research workers present is a simple discrimination of each test element between good students and bad students or between bright students and dull students. A valid test, thus considered, would be one which accurately discriminates between these two groups. A test element that would be answered by many bright or excellent children and answered by a few dull or poor students, where brightness and dullness are easily measured by an intelligence test or the teacher's opinion, would be a valid element for differentiating the ability that seems to exist.

Zubin[19] rated three methods of internal validity: the critical ratio, bi-serial r, and association methods. He suggested corrections which eliminate the influence of a single test element's

[14] Thorndike, Edward L., *Teacher's Word Book of 20,000 Most Frequently Used Words*, Bureau of Publications, Teachers College, Columbia University, 1932.

[15] Lentz, Theodore, Hershstein, Bertha, and Finch, F. H., "Evaluation of Methods of Evaluating Items," *Journal of Educational Psychology*, Vol. XXIII (May, 1932), pp. 344–350.

[16] Lindquist, E. F., and Cook, Walter W., "Experimental Procedures in Test Evaluation," *Journal of Experimental Education*, Vol. I (March, 1933), pp. 163–185.

[17] Lindquist, E. F., and Anderson H. R., "Achievement Tests in the Social Studies," *Educational Record*, Vol. XIV (April, 1933), pp. 198–256.

[18] Lindquist, E. F., and Cook, Walter W., *op. cit.*

[19] Zubin, Joseph, "The Method of Internal Consistency for Selecting Test Items," *Journal of Educational Psychology*, Vol. 25 (May, 1934), pp. 345–356.

being included in total scores. Long[20] criticized the Vincent[21] method of overlapping and suggested the following formula:

$$\text{Long Overlapping} = 1 - \frac{2 \times \Sigma(\text{``passes'' below ``fails''})}{(N_P)(N_F)},$$

where N_F is the number of failures or wrong responses, N_P is the number of passes or correct responses, and ("passes" below "fails") is determined by ranking test papers in the decreasing order of total scores; then, with respect to a single test item, each wrong response is assigned a value equal to the number of correct responses which fall below it in the order of ranking. The validity of each test item ranges from 0 for perfect desirable validity to 1 for a total absence of validity. The index is independent of the number of test papers.

The test-builder must recognize the fact that generalized conclusions relative to methods of establishing validity for specific forms and in specific subjects may be misleading and sometimes erroneous, and that validity concepts may vary from one field of learning to another field of learning. The whole problem must be viewed from both philosophical and scientific angles. Even then the validity of a test element depends on the skill and versatility of the test-builder. Practice and constant criticism, both logical and mathematical, must always attend test construction. The writer has constantly submitted test items for undergraduate class examinations to graduate classes and received many valuable suggestions. Each semester from 1930 to 1935, he has correlated the scores on each objective test with the total scores of the semester. The record illustrating the scores of one student is shown in Table VIII. The lowest average correlation for six objective tests was .81 ± .022 in the second semester of the year 1930–31, and the highest average correlation for six objective tests covering the same units of the course was .90 ± .013 for the second semester of the year 1934–35. These data indicate the improved validity of each test where the total scores on both objective tests and subjective tests and subjective ratings were used as a criterion.

---

[20] Long, John A., "Improved Overlapping Methods for Determining Validities of Test Items," *Journal of Experimental Education*, Vol. 2 (March, 1934), pp. 264–268.

[21] Vincent, Leona E., *A Study of Intelligence Test Elements, Contributions to Education*, No. 152, Bureau of Publications, Teachers College, Columbia University, 1924.

Monroe[22] states that discrimination as an index of validity refers to the power of a test to yield different scores for pupils actually possessing different degrees of ability or achievement, and that both reliability and validity can contribute to this quality of the test. He says, " . . . other things being equal, that test is best which shows the greatest discrimination between successive grade groups. Similar statements may be made with reference to a chronological age group or any other group which is known to differ in the ability measured." He states that the marked departure from the normal distribution for several hundred children in an unselected group would indicate lack of discrimination, and that a large number of zero scores or perfect scores would indicate a lack of ability to discriminate between extremely poor or extremely bright students. A valid test should sample all ranges of ability measured, and, therefore, should be sufficiently long and of sufficient number of questions to properly sample the abilities in achievement of the dullest and brightest pupils. Zero scores indicate that poor pupils have not been measured, while perfect scores indicate that the brightest students have not been measured. Approximation to the normal distribution is almost always accepted as an indication of discrimination by test-builders.

One of the most widely used methods of validating tests is the consensus of expert opinion. Elements of a test are valid because competent judges say that they are worth while and desirable. For this reason, schools should have tests made up by committees just as their courses of study are made up. To improve tests, data from groups of children should be examined and elements which do not show differences in groups known by teachers to be different should be eliminated. Items might be improved by rewriting. Improved tests will result from such studies, and these tests may be used a number of times or for several years. All copies can be numbered and carefully checked each time they are used. This will save much work on the part of teachers. Such tests should be revised whenever the curriculum is changed.

Validity is affected by the amount and nature of sampling. An ideal test should test all the outcomes and objectives of a course. Practically no test does this, though the highly diag-

---

[22] Monroe, W. S., *The Theory of Educational Measurements*, Boston, Houghton Mifflin Company, 1923, pp. 219–221.

nostic tests approach it. To the measure that the ideal of sampling is met, the test is valid. This concept of validity is well served by the pooling of the opinion of competent judges in the building of long, comprehensive, diagnostic tests. It demands measurements in every objective; and since many objectives are qualitative, qualitative or subjective ratings in some objectives must be employed. Validity, according to this concept, is dependent upon reliability.

IV. Comparative Validity and Reliability of Specific Objective Forms

Prior to 1929, Ruch[23] summarized a number of experiments which indicate that the recall form is more reliable that the recognition form. Recent investigations by Corey[24] seem to substantiate these general findings. Caldwell[25] found that the completion test has higher reliability than all other types, although Jones[26] found that the control completion and the true-false were equally reliable for the same unit of time. Generally speaking, the various types of objective tests have about equal reliability when compared on the basis of working time. Differences of reliability may be due primarily to the wording of individual items rather than to the objective form.

Fry,[27] in measuring the same fifty ideas or concepts in American history for Grades VII and VIII by different objective forms, reports the following reliability: completion, .89 ± .014; simple recall, .88 ± .015; multiple choice, .84 ± .020; matching, .81 ± .023; and true-false, .80 ± .025. He also examined the reliabilities of different objective forms used as semester tests on state-adopted textbooks in United States history, European history, medieval and modern history, American literature, and English literature, where the working time of each form was approximately fifteen minutes. For the latter forms he

---

[23] Ruch, G. M., *op. cit.*, 1929, pp. 291–306.

[24] Corey, S. M., "The Correlation between New-Type and Essay Examination Scores and the Relationship between Them and Intelligence as Measured by the Army Alpha," *School and Society*, Vol. 32 (December 20, 1930), pp. 849–850.

[25] Caldwell, J. B., "The Influence of Intelligence upon Performance in New and Old Type Examinations," abstracted master's thesis, *University of Colorado Studies* 18, December, 1930, p. 51.

[26] Jones, H. E., "A Comparison of Objective Examination Methods," *Educational Method*, Vol. 8 (February, 1929), pp. 273–276.

[27] Fry, Ralph B., *A Critical Study of Objective Tests*, unpublished master's thesis, University of Oklahoma Library, 1931.

reports the following average reliability: completion, .92 ± .011; recall, .91 ± .012; multiple choice, .90 ± .013; and matching, .83 ± .022. It is probable that reliability was affected as much by the wording of test elements as by objective forms. The study of Fry in measuring the same ideas in different forms reduces to some extent the differences in wording to a constant factor, since the same writer composed all test elements around the same fifty ideas or facts. This difference in wording of test elements, which seriously affects both reliability and validity, makes it extremely difficult to compare coefficients of reliability among different studies. However, one may conclude that, since the reliability of objective forms is about the same, different objective forms can be used, and that the selection of objective forms should be based on other considerations, such as validity, difficulty, and economy of printing space. Lee and Symonds,[28] after reviewing a number of studies, concluded that the objective test is more reliable than the subjective.

The question is often asked whether the objective tests which teachers build are as reliable as standardized tests. The reliability of tests which have become parts of theses at the University of Oklahoma indicates that teacher-made objective tests may be very reliable. Reliabilities of objective tests which have become parts of theses at the University of Oklahoma exceed this coefficient. Scott,[29] for a fifty-minute test in elementary music, gives the following reliabilities: Grade IV, .947; Grade V, .978; Grade VI, .979; and Grades IV–VI, .981. Peeler,[30] for a fifty-minute grammar test, gives the following reliabilities: Form A, .971; Form B, .975. House,[31] for a short test at the end of each of the units in a course in chemistry, gives for 25 tests and two semester examinations reliabilities running from .83 to .97 with an average of .897. Beck[32] gives a reliability for the sentence completion form between Form A and Form B of an English composition test as high as .969.

[28] Lee and Symonds, op. cit., 1933, pp. 25–26; 1934, p. 170.

[29] Scott, Delbert, Achievement in Music of Intermediate Grade Pupils, University of Oklahoma, 1934, p. 48.

[30] Peeler, Sula K., A Standardized High School Grammar Test for Oklahoma, University of Oklahoma, 1934, p. 15.

[31] House, Otis, A Measure of the Amount of Learning in High School Chemistry, University of Oklahoma, 1934, p. 22.

[32] Beck, Roland L., The Reliability and Validity of a Natural Test in English Composition for High School Seniors and College Freshmen, doctorate dissertation, University of Oklahoma, 1932, p. 47.

With respect to the validity of objective forms, Ruch[33] concludes after reviewing a number of researches that the objective test is at least as valid as the traditional or subjective test and that recognition tests measure about the same abilities as recall tests. When the validity coefficient is corrected for attenuation,[34] true-false, multiple choice, and recall tests measure roughly the same abilities. Corey[35] also finds that subjective and objective tests measure the same functions. Peters and Martz[36] found that multiple choice and completion tests were slightly more valid than essay tests when school marks were used as a criterion. Eurich[37] reports about equal validity for the essay, completion, multiple choice, and true-false tests. Watson and Crawford[38] in measuring physics found the completion test to be most valid, the essay test almost as valid, the multiple choice or best-answer next but considerably lower, and the true-false lowest. Hurd[39] found that multiple choice and simple recall of the same subject-matter content correlated .72. One might conclude that the objective tests, with probably the exception of the true-false type, are as valid as, or perhaps slightly more valid than, the essay or subjective examination; and that, of all the objective forms, the completion or simple recall seems to be the most valid.

Teachers often wonder whether the objective examinations they build are as valid as standardized tests. A logical review of the situation may be more accurate than statistical analysis. If a standardized test does not sample the curricula material to which the children have been exposed, it cannot be valid for what these children have learned, unless the subject matter is very broad and occurs in many situations outside of school. This is probably true of reading and English usage to a greater

---

[33] Ruch, G. M., op. cit., 1929, p. 290.

[34] Attenuation is a correction of the correlation between two independent measures which indicates what the correlation might be if the two measures correlated were perfectly reliable. The size of the correlation between two variables is lowered by the unreliability of the measurement of the variables.

[35] Corey, S. M., "The Effect of Weighting Exercises in New-Type Examinations," Journal of Educational Psychology, Vol. 21 (May, 1930), pp. 383–385.

[36] Peters, C. C., and Martz, H. B., "A Study of the Validity of Various Types of Examinations," School and Society, Vol. 33 (March 7, 1931), pp. 336–338.

[37] Eurich, A. C., "Four Types of Examinations Compared and Evaluated," Journal of Educational Psychology, Vol. 22 (April, 1931), pp. 268–278.

[38] Watson, D. R., and Crawford, C. C., "Four Types of Tests," High School Teacher, Vol. 6 (September, 1930), pp. 282–283.

[39] Hurd, A. W., Problems of Science Teaching at the College Level, Minneapolis, The University of Minnesota Press, 1929, 195 pp.

extent than of any other subjects, especially arithmetic, algebra, history, and geography. However, statistical studies indicate that the teacher-made objective tests are as valid as standardized tests. Wright[40] compared scores on the Stanford Achievement Test and scores on comprehensive tests based on the Indiana State Course of Study for Grades VII and VIII with teachers' marks. He found that the correlations of teachers' marks with scores on standardized tests of history and language were lower than the correlations with the Indiana objective tests, but that the correlations in reading and arithmetic were about the same with the Indiana objective tests and with the standardized tests. Broom, Douglas, and Rudd[41] found teacher-made objective tests in reading as valid as standardized tests. Perry and Broom[42] in studying tests in a course in foods stated that carefully constructed teacher-made tests may be as valid and as reliable as standardized tests.

The validity of oral objective tests should be considered because printed, mimeographed, or hectographed objective tests are sometimes expensive and present considerable trouble. The objective test has been given orally very successfully. The author has been using such tests orally in his classes for a number of years and finds in courses in educational measurements that the comparative reliability of 100 true-false items is, mimeographed, .90 ± .015, oral, .88 ± .018; but the oral test takes slightly more time for dictation, as he always repeats each statement twice—and twice only. The reliability of oral multiple choice is .87 ± .017 and that of the written is .92 ± .012, but the oral takes considerably more time. A reliability of .90 ± .015 was found for 50 oral and 50 written simple recall items. The reliability for 50 sentence completions is: written, .92 ± .012, oral, .89 ± .017.

Briggs and Armacost[43] conclude: " . . . both from statistical data and their impression, that the oral true-false test, as

[40] Wright, W. W., "The Development and Uses of a Composite Achievement Test," *Bulletin of the School of Education,* Indiana University, Vol. 5, No. 3. 1929.

[41] Broom, M. E., Douglas, J., and Rudd, M., "On the Validity of Silent Reading Tests," *Journal of Applied Psychology,* Vol. 15 (February, 1931), pp. 35–38.

[42] Perry, Fay V., and Broom, M. E., "Study of Standard Tests and of Teacher-Made Objective Tests in Foods," *Journal of Educational Research,* Vol. XXVI (October, 1932), pp. 102–104.

[43] Briggs, Thomas H., and Armacost, George H., "Results of an Oral True-False Test," *Journal of Educational Research,* Vol. XXVI (April, 1933), pp. 595–596.

a measure of immediate recall, compares very favorably with such a test presented in visual form." Lehman[44] reports practically identical reliabilities for oral and mimeographed tests. Sims and Knox[45] found that when the Thorndike Test of Word Knowledge, a multiple choice vocabulary test, was presented orally, it was slightly more difficult than when presented in visual form, and the oral validities were slightly less. Crawford,[46] in asking the preference for mimeograph or oral tests of students who had had considerable experience with both types, found that 42 of the 120 preferred a mimeographed form, 43 preferred the oral form, and 35 stated no preference. Stumpf[47] reports a preference of 84 per cent of the students for written examinations and 16 per cent for oral.

Oral objective tests may be used to supplement, but not to replace, objective tests in visual or written form. The general principle may hold that many forms of reliable and valid tests should be used to test subject matter completely and to measure adequately children who may react somewhat differently to different forms. The concept back of an adequate testing program is not only adequacy in sampling subject matter, but adequacy in sampling children whose natures and methods of responses vary greatly. Comprehensiveness in testing will contribute much to our accurate and valid knowledge of boys and girls, and will make testing more thoroughly diagnostic and more valuable for remedial treatment.

V. Effect of Objective Tests on Children's Attitudes

Children's attitudes are largely affected by a concept which they call *fairness*. Strictly speaking, this is probably statistical reliability. The fair teacher is one who is accurate. Fairness from this standpoint can be improved by objective tests. If children know that their tests are fair and accurate, their attitude toward testing will not be one of fear and emotional disturbance.

---

[44] Lehman, H. C., "The Oral Versus the Mimeographed True-False," *School and Society*, Vol. 30 (October, 1929), pp. 470–472.

[45] Sims, V. M., and Knox, L. B., "The Reliability and Validity of Multiple-Response Tests When Presented Orally," *Journal of Educational Psychology*, Vol. XXIII (December, 1932), pp. 656–662.

[46] Crawford. C. C., "Preference versus Performance in Taking Oral True-False Tests," *School Review*, Vol. XL (February, 1932), pp. 138–141.

[47] Stumpf, N. Franklin, "Listening Versus Reading Method in the True-False Examination," *Journal of Applied Psychology*, Vol. XV (December, 1931), pp. 555–562.

By using objective tests and presenting to individual pupils their scores along with the distribution of the whole class, so that the pupils may see exactly where their scores are with respect to the other pupils in the class, incentives for study and improvement can be created. There is no need of overemphasis of competition; but, since competition exists in all walks of life, including vocations and leisure, games and politics, professional services and business practices, it is something that should be faced squarely and honestly by teachers.

Monroe and Engelhart,[48] in reviewing the studies that affect learning, stated that the studies they examined were almost unanimously in favor of the contention that knowledge of progress of learning is an effective stimulus. This study and others have indicated that the emphasis should be placed on success rather than failure, and this can be done by judicious teachers who will accurately measure all phases of the achievement of children. Even children who are dull in subject matter may achieve in play, physical sport, construction, hobbies, music, or art, which later may become a vocation.

It certainly does not help children to give them misinformation about their achievement. Emotional disturbances do not naturally accompany a knowledge of low scores. But emotional disturbances may be excited by the way in which the teacher handles the report and censures the child. Teachers should no more censure children who make low scores than physicians should censure their patients who make low scores in blood pressure and other measures of health and who are ill. Low scores indicate the need of diagnosis, remedial treatment, or, perhaps, a complete change in subject matter to fit the needs and individual differences of children who may not be succeeding in what some adults think they should learn. Natural abilities, habits, and learned interests may indicate clearly that the school is not providing them an opportunity to learn in a field best suited to their abilities and capacities.

VI. Advantages of Objective Tests

1. Objectivity. The chief advantage of objective tests is the fact that they can be made highly objective and so reduce the personal opinion of the teacher or scorer to a negligible

---

[48] Monroe, W. S., and Engelhart, M. D., "Stimulating Learning Activities," *University of Illinois Bulletin,* Vol. 28, No. 1, *Bureau of Educational Research Bulletin,* No. 51, 1930, p. 48.

factor. Objectivity is the main element contributing to reliability. This property of our instruments for physical measurements has made the sciences outstanding in accuracy. Objectivity in measuring the body and its vital organs and secretions has done more to perfect medical diagnosis than almost anything else. The products of the human mind are more complex than those of the body and must often be broken into rather simple elements before they can be measured objectively. Science demands the substitution of objective measurement for subjective measurement wherever the objects of measurement or traits are objective. Many of our educational thoughts give responses which are perfectly objective and always have been recognized as either right or wrong responses. Most of the facts learned in all walks of life can be measured objectively, provided there are rules for determining what is to be counted and the number of points to be assigned to the things counted. The rule book in football defines a touchdown. It is only necessary for the referee to decide that the middle of the ball has touched the goal line, and this is partially subjective. But the fact that it is the middle of the ball and any part of the goal line makes it so objective that there is little disagreement. The rule book also states that the touchdown counts six points. Measurements in education are similar. If we can have rules for what we count and for the number of points assigned to the thing counted, an evaluation of the achievement of pupils will be on an impersonal basis and will become more nearly scientific, accurate, and fair.

2. Sampling. Other things being equal, the larger the number of responses measured in a given unit of time, the more reliable the test. In other words, extensive sampling increases reliability. It is perfectly obvious to anyone that 10 questions are not so reliable as 100, and a test which will permit the answering of 100 questions within the same period of time as 10 questions is much more reliable. For this reason, the objective tests are sometimes called "short-answer tests." Brevity of response also permits higher objectivity in scoring. It is easier to score uniformly a single word than a sentence, and it is easier to score a sentence than a paragraph or a complete composition. Brevity of response and exactness of response also reduce bluffing and minimize speed and fluency of writing, factors that, when they are present but are not to be measured in the test, become an adulterant and lower validity.

The subjective examination permits of intensive sampling in a few areas of knowledge by very comprehensive questions to which considerable time is allowed for thorough discussion. The objective test can also be used for intensive sampling by simply increasing the number of items.

3. Scoring. An essay examination can be graded but cannot be scored. *Scoring* means counting right or wrong responses. *Grading* means interpreting quality in terms of some criterion. Grading expresses a degree or rank of any order and also implies position with respect to qualities or to units of measure. The objective test can be scored; that is, answers can be counted right or wrong. With the key of answers, scoring can often be reduced to a routine clerical operation. The most objective test can be scored the most easily: the operation requires little intelligence and no subject-matter knowledge. When knowledge of the subject is introduced into scoring, scoring becomes less objective and a part of it becomes subjective.

Scoring is more rapid than grading and saves much time in the measurement of achievement. When time is saved in the whole process of testing and measuring, the additional time can be placed on the structure of the test, and this is where the large amount of the time should be placed. It is probable that, for most examinations, more time will be needed to build objective tests than subjective. However, if subjective tests are to be graded accurately, time will be needed to make the rules for grading. The use of rules will require additional time in grading but will increase accuracy.

4. Reliability. Objective examinations are usually more reliable than subjective examinations. By *reliability* is meant the consistency of the score or the accuracy with which a test measures what it does measure, not what it claims or purports to measure. Reliability refers to the faith that may be placed in a test. When several forms of a test are made and all of these forms yield the same score for each individual, the test is perfectly reliable. Of course, the variability of the person affects the reliability of the test.

Reliability is the second important fact about any test. If tests and measuring instruments are not accurate, we cannot place confidence in the units of measurement. By the reliability of the test we mean just about the same thing as when we talk about the reliability of a person.

5. Validity. From the previous discussion of validity the reader will very likely infer that objective tests are probably as valid as subjective tests. More depends upon the actual composition than the form. Skill in composition can come only by actual practice and revision. There is not enough experimental evidence covering all subjects and all grades to compare definitely the validity of subjective and objective tests. The teacher must be guided largely by her judgment and her own analysis. She could correlate the scores on her objective tests with semester points, correlate the scores on her subjective tests with semester points, and find whether objective or subjective tests correlate better with the total points for a semester. If she finds a considerable difference, this difference would favor the test having the higher correlation with the total.

An interesting experiment by the writer and his students will illustrate this point: An objective test in geometry by a graduate student was given to nearly one hundred students in a high school in Oklahoma. This test covered one semester's work and was about an hour long. The teachers of geometry in the high school said that it did not measure what they taught, but merely small particles—not the logical reasoning which was to be developed by the course—but their subjective tests would measure what they taught. The correlation between the objective tests and the semester grades was .89 ± .015. The correlation of the teachers' own examinations with the semester grades, which also included the grade on this final examination, was .77 ± .040.

Further evidence of the validity of objective tests is shown by Rinsland,[49] who correlated the scores on objective tests with the teachers' semester grades in six high school courses in history and literature and found correlations ranging from .71 ± .033 to .89 ± .029.

6. Diagnosis. The objective form of test lends itself to detailed diagnosis, and this is one of its characteristics that make it so greatly superior to the usual essay or subjective examination. Where an examination is unreliable and subjective, diagnosis is practically impossible, because diagnosis demands two things: first, a measurement in detail and sometimes in minute detail; second, a high degree of accuracy in the measure-

---

[49] Rinsland, Martha O'Daniel, 1936, *op. cit.*, pp. 62–89.

ment of these details. The very nature of the objective test permits the measurement of detail. As a matter of fact, this has been counted as one of its disadvantages because some writers claim that it measures simple, isolated facts. There are many factors, such as quality, style, organization, and originality, that objective tests do not measure. Validity in such a case demands subjective measurements.

VII. Disadvantages or Limitations of Objective Tests

1. Limit expression. The objective tests provide little or no opportunity for the organization of thoughts and their expression in grammatically correct sentences, paragraphs, and compositions. The nature of the objective test unit requires a brief response. No one in the field of measurement has ever made a plan for objective tests which cover organization and expression; but much of life's responses are not complete essays. Some of the greatest decisions in life, to be determined by reasoning from facts, experiences, and future hopes, are expressed in one word, "Yes" or "No"—the responses of a true-false test. The ability to organize and express thought in sentences and paragraphs is essential in every subject, and this ability should be measured. The essay type of examination offers the best opportunity for securing the responses of organization and expression, but the usual method of grading this type of examination is very inaccurate and not very reliable. The methods of grading that have been described in the previous chapter should be used.

Proper provision should be made to give the student an opportunity to organize and write his thoughts in a given subject. The final examination is no time for this. As a matter of fact, such essay examinations should be in the form of unit papers, short compositions, and term papers. The student should generally be given time to write and rewrite, to organize and reorganize. When the writings of instructors are to be passed on by associates and superiors, they demand sufficient time for capable writing. Few compositions in life have to be written under the speed and pressure of classroom examinations. If sentence structure and correct mechanics of English usage are to be considered, and probably they should be in all examinations of this type, a student should be given time to produce a finished product. Thus, the measurement of organization and expression is not a limitation of the objective test any more than

the measurement of stature is a limitation of a scale that measures weight. Educational achievement is complicated and expresses itself in many ways. What we who analyze and diagnose achievement should do is to invent many instruments to measure all phases of learning.

2. The objective test may become a measure of factual items only. Most teachers are too lax with their distinction between a memory question and a reasoning question. The exact difference is hard to define. A memory question may demand a recall of a single isolated fact; but whenever two or more facts are recalled in any relationship whatever, or are recalled in a new relationship, it is very probable that more or less reasoning is involved.

Psychologically, the writer cannot conceive of facts existing in the human mind in isolation. We think only in terms of facts. The creation of thousands of words by original thinkers is proof that it is impossible to convey thought without words and facts. Thinking is not done in a vacuum, and the best thinking is certainly done with the most accurate and largest number of facts in a given field. As Wood and Beers[50] have said, "One might infer that the world's greatest thinkers were ignoramuses who avoided knowledge like a plague and owed their thinking ability to their ignorance," and " . . . no first-rate thinker has ever discredited facts." In the elementary school and high school, not many children are doing original reasoning. If a child reproduces in an essay examination a line of reasoning he has read or has been given him by someone, this is memory and recall. But there is nothing in the form of objective tests to prevent the measurement of reasoning. The multiple-choice test and even the true-false will give the teacher many opportunities to measure whatever reasoning elementary and high school students will do. The sentence-completion test in which several words have been carefully omitted from each sentence should present reasoning difficulties for the most advanced.

The main objection to measuring facts is really the objection to teaching facts without the proper motivation and interest of children in arithmetic, geography, history, and other subjects. The mechanical teaching of facts to children who have no use

---

[50] Wood, Ben D., and Beers, F. S., "Knowledge Versus Thinking?" *Teachers College Record,* Vol. XXXVII (March, 1936), p. 488.

for them in their present world and no interest in learning them has been severely and justly criticized by many progressive teachers for a long time. The methods by which facts are learned and the drives, interests, and attitudes connected with the learning of them should be of deep concern to all.

3. Objective tests require some form of duplication. This is true, but there is no reason why duplicating machines should not be furnished the teacher for reproducing reliable measuring instruments. Every phase of life has produced reliable instruments, sometimes at a great cost. If child life and child learning are worth while, this item will not be a serious factor. At any rate, duplication is not expensive. Hectographs, ditto machines, and mimeographing machines are available everywhere and at a low cost.

Quite often the cost of duplication may be reduced by having the children write responses on tablet paper. The mimeographed test contains only the test items. The pupil simply records the number of the test item on blank paper and writes the answer beside it. This can be readily done with all forms of multiple choice, sentence completion, sentence recall, matching, and alternative response. Some forms of objective tests can be given orally, especially the simple recall in question and statement form, the multiple choice, the true-false, and sentence completion. Drawings may also be employed if they are placed on the board by the teacher.

4. Limitations of statistical techniques. There probably has been an overemphasis of the importance of statistical methods and an underemphasis of careful analysis of the form of the stimuli and the nature of the responses in tests in the past few years. Several writers have noted this tendency and called attention to its limitations and dangers.

Beck,[51] in evaluating the sentence completion form for measuring English usage, calls attention to the nature of the stimuli presented to students as a basic factor of validity. He says, "A strong argument for the validity of the test is the fact that the sentence completion form does require the student to focus his attention on the meaning and the completion of the sentences and thus measures his natural or habitual composition reactions, and that the test samples many more rules than even

---

[51] Beck, Roland L., "A Natural Test of English Usage," *Journal of Experimental Education*, Vol. I (March, 1933), p. 285.

a large number of free compositions would contain." Rinsland and Beck[52] point out the limitations of the reliability of the criterion and of the correlation of the test scores with the criterion. They say, "Though it shows a definite relation, the coefficient of validity (.728), secured by correlating the weighted errors per one hundred running words and the test scores, was not as high a criterion validity as might be expected in a natural test of English composition. The limitations of the criterion (weighted errors per 100 running words of students' compositions) explain this in part. First, all items of the test were not sampled in the criterion, and second, some errors in the criterion were repeated so frequently in certain cases that the validity coefficient was seriously affected. In each student's composition, all the errors were counted every time they occurred. These considerations seem to indicate that the true validity is really higher than the criterion validity coefficient obtained."

Thurstone[53] cautions against the lack of understanding of the assumptions underlying the derivation of statistical formulas and is very careful to explain these assumptions and limitations in his own statistical procedures. Monroe[54] states that many who use tests think that objectivity is absolutely necessary, that all objective tests are reliable, that reliable tests always measure the specific trait or function named, and that statistical validity is always the sole or safest guarantee. Lindquist[55] agrees with the writers who believe that statistical techniques are far more fallible than has been supposed. He calls for "internal analyses of test materials."

No statistical refinement can raise the reliability or validity of a test above the level of the composition of the individual items and their selection from the areas to be measured. Nothing in mathematics can take the place of a careful study of the nature of the subject measured, the nature and form of the stimuli which are to provoke response, and the form and nature of the responses themselves. Such study demands a knowledge of the psychology of the child as much as a knowledge of the subject. Students are tested in a subject area, and always the

---

[52] Rinsland, Henry D., and Beck, Roland L., *op. cit.*, *Teacher's Manual*, 1934, pp. 8–9.
[53] Thurstone, L. L., *The Reliability and Validity of Tests*, Edwards Brothers, Ann Arbor, Mich., 1931, p. 113.
[54] Monroe, Walter S., "Hazards in the Measurement of Achievement," *School and Society*, Vol. 41 (January 12, 1935), pp. 48–52.
[55] Lindquist, E. F., *op. cit.*, 1935, p. 496.

emotional and concomitant learnings as well as the subject-matter items enter into the responses. Nothing can take the place of qualitative and logical analysis of the whole testing situation—statistics, yes, but not first nor last.

VIII. Wide Use of Objective Tests

The importance and value of more valid and reliable methods of measurements in all walks of life and the realization that education can also profit by these techniques have had much to do with the rapid increase in the use of teacher-made objective tests. Lee[56] surveyed the practices of 1,600 teachers in 70 schools and found that the teacher-made tests were used eight times as frequently as standardized tests. Lee[57] reports the opinion of research directors who state that the training of teachers in building better tests is one of the most important needs in public schools, and that the second need is constructing objective tests based on courses of study. Tracy,[58] in Kansas, and Rinsland,[59] in Oklahoma, have made extensive use of published objective tests based on state courses of study and state textbooks. The curricular validity of elements in such tests is about as high as can be obtained where uniform tests and the courses of study are used.

Buros[60] lists a number of state-wide objective testing programs in the states of South Dakota, Indiana, Texas, and Iowa. Many of these tests are built by committees of teachers working under the editorship of one person. In a large number of cities tests are being built by teachers working under the supervisors or directors of measurements. The writer has assisted teachers and supervisors in a number of cities in Oklahoma to build objective tests in many subjects. These tests have become more or less standardized by uniform norms and statistical analysis of difficulty, reliability, and validity.

---

[56] Lee, L. Murray, *Testing Programs for Secondary Schools*, doctor's dissertation, Teachers College, Columbia University, 1932 (Burbank, California, the author, 1934).

[57] Lee, J. Murray, "Needed Developments in Measurement for Secondary Schools," *Education*, Vol. LIII (March, 1933), pp. 424–427.

[58] Tracy, Orval S., Tracy Short-Answer Tests for Kansas, Saml Dodsworth Stationery Company, Kansas City, Mo., 1930–1935.

[59] Rinsland, ed., *op. cit.*

[60] Buros, Oscar K., "Educational, Psychological, and Personality Tests of 1933, 1934, and 1935," *Studies in Education No. 9* (July, 1936), Rutgers University, New Brunswick, New Jersey.

Lee and Segel,[61] in a study of teachers' attitudes toward giving and using standardized tests and tests of their own construction, report that 20 per cent of the teachers prefer standardized tests while 30 per cent prefer their own. Half of the teachers did not reply. In measuring the attitudes of teachers toward the frequency with which tests should be given, they found that 4 per cent think that tests should be given every day, 22 per cent think that they should be given every week, 13 per cent think that they should be given every two weeks, 9 per cent think that they should be given every month, and 10 per cent think that they should be given every semester. Sixty-six per cent of the teachers feel that tests should be given at the completion of a topic or a unit. Thirty-five per cent of the teachers indicate that they desire standardized tests at the end of the semester.

The increasing importance of objective testing can be seen from the large number of studies listed in reviews by Lee and Symonds[62] and Lindquist[63]; the large number of tests listed in the bibliography of tests by Buros[64]; the suggestions contained in a bulletin from the Office of Education[65]; the reports on the wide use of tests in a survey reported by Lee and Segel[66]; the reports on state-wide scholarship contests in such states as Ohio[67] and Iowa[68]; the work of the examination committees of some of the larger universities like Minnesota[69] and Chicago[70]; the increase in the use of objective and standardized tests in colleges, largely through the work of the American Council on Education, the division of Co-operative Test Service under the

---

[61] Lee, J. Murray, and Segel, David, *Testing Practices of High-School Teachers*, Bulletin No. 9, 1936, Office of Education, Washington, D. C.

[62] Lee and Symonds, *op. cit.*, 1933 and 1934.

[63] Lindquist, *op. cit.*, 1935.

[64] Buros, *op. cit.*, 1936.

[65] Segel, David, *Elementary School Graduation Examinations*, Bulletin No. 16, 1935, Office of Education, Washington, D. C.

[66] Lee and Segel, *op. cit.*, 1936.

[67] Wood, Ray G., *Bulletin of Research Activities of the Ohio Scholarship Tests of the Ohio State Department of Education*, State Department of Education, Columbus, Ohio, September, 1936.

[68] Iowa Every-Pupil Tests, Iowa University, Iowa City, Iowa.

[69] Committee on Educational Research, *Studies in College Examinations*, University of Minnesota, Minneapolis, 1934.

[70] Board of Examinations, *Manual of Examination Methods*, preliminary ed., University of Chicago Book Store, July, 1933.

direction of Dr. Ben D. Wood[71]; and the increase in the use of objective tests by the Federal Civil Service Commission, many civil service bureaus, and employment bureaus.

IX. The Effects of Objective Tests

Woody and others[72] in a symposium discussed the effects of measurements on instruction. Theisen[73] thinks that measurements will not produce a feeling of satisfaction with *status quo*, but an *uneasiness* which will result in the desire to diagnose. This is a wholesome effect. Monroe[74] thinks that the increasing use of objective tests (he probably means published standardized tests) " . . . will tend to nullify our attempts to change the curriculum." He states that test-builders are probably the real curriculum makers. If they have been, it is because standardized tests have been used beyond their state of usefulness and because the results of standardized tests have been continued as objectives long after objectives should have been changed. Standardized tests should be changed to fit the changing curriculum. Objective tests which teachers build would seldom be used to perpetuate old curricular material. Teachers can and do change their tests to fit changing needs and objectives. This is one of the advantages of teacher-made objective tests—they can be readily changed without the loss of much printed material. The view just quoted from Monroe is opposed by a statement from Stalnaker and Richardson[75] from the same symposium, who say, " . . . the achievement examination reflects the course content as taught" and " . . . the examination clarifies objectives and forces out objectives that are practically impossible." They also call attention to the need of measuring all phases of student conduct. Douglass[76] thinks that " . . . the character and force of the influence of testing upon instruction is not only a matter of the nature of the

[71] Co-operative Test Service of the American Council on Education, *Announcement of Tests*, November, 1934, 500 West 116th Street, New York City, Ben D. Wood, Director.

[72] Woody, Clifford, and others, "A Symposium on the Effects of Measurement on Instruction," *Journal of Educational Research*, Vol. XXVIII (March, 1935), pp. 481–527; see also *A Handbook*, Co-operative Test Service, October, 1936.

[73] Theisen, W. W., in *op. cit.* by Woody, 1935, p. 484.

[74] Monroe, Walter S., in *op. cit.* by Woody, 1935, p. 497.

[75] Stalnaker, John M., and Richardson, M. W., in *op. cit.* by Woody, 1935, p. 507.

[76] Douglass, Harl R., in *op. cit.* by Woody, 1935, p. 511.

tests but even more a matter of the use and importance allotted to the test scores." Woody,[77] in summarizing and appraising the reactions of the other contributors to the symposium, believes that all the authors recognize the contribution of measurements to the improvement of instruction; all authors agree that most objections to measurements arise from poor test construction and poor interpretation of test results; most of the writers point out the need for developing instruments of measurements for the many forms of conduct other than educational achievement; and most contributors imply that measurements must be evaluated in terms of the purposes for which they are designed. Keys[78] reports slightly harmful suggestions from false items in college classes in educational psychology; while Sproule,[79] in testing in Grades V, VII, and IX, thinks that false items do not leave false impressions, but that if students were allowed to correct false items, practically all negative effects were lost and learning improved.

Class,[80] Crawford,[81] Meyer,[82] and Terry,[83] in experimenting with college students, show that the form of the examination and the preparation for an examination affect study habits. It is obvious that students always have and always will study for what they know will be tested. Probably children in the elementary and high schools will do very much the same as college students do. When students know that they will be measured for details, they study details; and when they know that they will be measured for a general view of a subject, they will study to get a general idea. Both types of studying and testing should be used so that pupils will get, not only a detailed picture of important facts, but also a connected picture of facts in logical or historical order.

---

[77] Woody, *op. cit.*, 1935, pp. 520–527.

[78] Keys, Noel, "The Influence of True-False Items on Specific Learning," *Journal of Educational Psychology*, Vol. 25 (October, 1934), pp. 511–520.

[79] Sproule, Chester E., "Suggestion Effects of the True-False Test," *Journal of Educational Psychology*, Vol. 25 (April, 1934), pp. 281–285.

[80] Class, E. C., "The Effect of the Kind of Test Announcement on Students' Preparation," *Journal of Educational Research*, Vol. 28 (January, 1935), pp. 358–361.

[81] Crawford, C. C., "How to Study for Objective Tests," *Education*, Vol. 53 (March, 1933), pp. 413–416.

[82] Meyer, George, "An Experimental Study of the Old and New Types of Examination; II, Methods of Study," *Journal of Educational Psychology*, Vol. 26 (January, 1936), pp. 30–40.

[83] Terry, Paul W., "How Students Review for Objective and Essay Tests," *Elementary School Journal*, Vol. 33 (April, 1933), pp. 592–603.

Examinations and tests are on the increase, and objective tests are greatly increasing in importance, as has just been shown in a previous paragraph. Increasingly large numbers of high school graduates and adults will be taking civil service examinations as the increasing demands for civil service methods are put into practice by Federal and state governments. The preparation of children for the objective form of examination so widely used by civil service bureaus will not be artificial or unprogressive. Scientific improvement in education will continue to demand improved measuring instruments. This will result in more valid and reliable objective and subjective tests and scales for all forms of human conduct.

There are several ways in which examinations may be improved in the future—defining the behaviors to be tested, securing as adequate and complete sampling as time and research will permit, improving and designing new objective forms, improving the structure and rating of subjective examinations, and the critical analysis of examinations by logical and statistical methods. Here is a field for unlimited improvement toward a better understanding of child life for those who have imagination and technical training.

Selected List of References on the Value and Structure of Tests

Briggs, Thomas H., and Armacost, George H., "Results of an Oral True-False Test," *Journal of Educational Research*, Vol. 26 (April, 1933), pp. 595–596.

Broom, M. E., Douglas, J., and Rudd, M., "On the Validity of Silent Reading Tests," *Journal of Applied Psychology*, Vol. 15 (February, 1931), pp. 35–38.

Caldwell, J. B., "The Influence of Intelligence upon Performance in New and Old Type Examinations," Abstracted Master's Thesis, *University of Colorado Studies 18*, December, 1930, p. 51.

Class, E. C., "Effect of Kind of Test Announcement on Students' Preparation," *Journal of Educational Research*, Vol. 28 (January, 1935), pp. 358–361.

Cooper, A. A., "Testing in Terms of Our Objectives," *School and Community*, Vol. 22 (January, 1936), pp. 32–34.

Corey, Stephen Maxwell, "The Correlation between New-Type and Essay Examination Scores and the Relationship between them and Intelligence as Measured by the Army Alpha," *School and Society*, Vol. 32, Dec. 20, 1930, pp. 849–850.

———, "The Effect of Weighting Exercises in a New Type Examination," *Journal of Educational Psychology*, Vol. 21 (May, 1930), pp. 383–385.

Crawford, C. C., "How to Study for Objective Tests," *Education*, Vol. 53 (March, 1933), pp. 413–416.

———, "Preference versus Performance in Taking Oral True-False Examinations," *School Review*, Vol. 40 (February, 1932), pp. 138–141.

Douglass, H. R., and Talmadge, M., "How University Students Prepare for New Types of Examinations," *School and Society*, Vol. 39, Mar. 10, 1934, pp. 318–320.

Eurich, A. C., "Four Types of Examinations Compared and Evaluated," *Journal of Educational Psychology*, Vol. 22 (April, 1931), pp. 268–278.

Hartog, P. J., "Examination of Examinations," *Times Educational Supplement*, Vol. 1,086 (February, 1936), p. 65.

———, "Survey of the Report of the English Committee of the International Institute Examinations Enquiry," *Year Book of Education*, 1936, pp. 834–846.

Hillbrand, E. K., "How to Prepare for and Take an Examination," *Kansas Teacher and Western School Journal*, Vol. 42 (March, 1936), p. 32.

Hudelson, Earl, "The Effect of Objective Standards upon Composition Teachers' Judgments," *Journal of Educational Research*, Vol. 12 (December, 1925), pp. 329–340.

Jones, H. E., "Comparison of Objective Examination Methods," *Educational Methods*, Vol. 8 (February, 1929), pp. 273–276.

Klise, Nira M., "Student Opinions of Type of Examination," *School and Society*, Vol. 24, July 3, 1926, pp. 23–24.

Lehman, H. C., "The Oral Versus the Mimeographed True-False," *School and Society*, Vol. 30, Oct. 5, 1929, pp. 470–472.

Leighton, R. W., "Improvement of the Essay Type Examination," *Research in Higher Education*, United States Department of Interior, Office of Education, Washington, D. C., Government Printing Office, Bulletin No. 12, 1932, pp. 15–20.

Lentz, Theo., Hershstein, Bertha, and Finch, F. H., "Evaluation of Methods of Evaluating Test Items," *Journal of Educational Psychology*, Vol. 23 (May, 1932), pp. 344–350.

Lindquist, E. F., "Objective Achievement Test Construction," *Review of Educational Research*, Vol. 5 (December, 1935), pp. 469–483.

———, and Anderson, H. R., "Achievement Tests in the Social Studies," *Educational Record*, Vol. 14 (April, 1933), pp. 198–256.

———, and Cook, Walter W., "Experimental Procedures in Test Evaluation," *Journal of Experimental Education*, Vol. 1 (March, 1933), pp. 163–185.

McKee, J. H., "Subjective and (or versus) Objective," *English Journal* (col. ed.), Vol. 23 (February, 1934), pp. 127–133.

Meyer, George, "Essay Type of Examination," *American School Board Journal*, Vol. 89 (December, 1934), pp. 17–18.

———, "Experimental Study of the Old and New Types of Examination," *Journal of Educational Psychology*, Vol. 25 (December, 1934), pp. 641–661.

Monroe, Walter S., and Englehart, M. D., "Stimulating Learning Activities," *University of Illinois Bulletin 28*, No. 1, Bureau of Educational Research Bulletin, University of Illinois, Urbana, Ill., No. 51, 1930, p. 48.

———, and Souders, Lloyd B., "The Present Status of Written Examinations and Suggestions for Their Improvement," *Bureau of Educational Research Bulletin*, University of Illinois, Urbana, Ill., No. 17, 1923, p. 77.

Odell, C. W., "The Use of Scales for Rating Pupils' Answers to Thought Questions," *Bulletin No. 46*, Bureau of Educational Research, University of Illinois, May 7, 1929.

Perry, Fay V., and Broom, M. E., "A Study of Standard Tests and Teacher-Made Objective Tests in Foods," *Journal of Educational Research*, Vol. 26 (October, 1932), pp. 102–104.

Peters, C. C., and Martz, H. B., "A Study of the Validity of Different Types of Examinations," *School and Society*, Vol. 33 (March, 1931), pp. 336–338.

Sims, Verner Martin, "Essay Examination Questions Classified on the Basis of Objectivity," *School and Society*, Vol. 35, Jan. 16, 1932, pp. 100–102.

———, "Improving the Measuring Qualities of an Essay Examination," *Journal of Educational Research*, Vol. 27 (1933), pp. 20–31.

———, "Reducing the Variability of Essay Examination Marks through Elimination of Variations in Standards of Grading," *Journal of Educational Research*, Vol. 26 (May, 1933), p. 637.

———, "Studies in Reducing the Variability of Marks Given on Essay Examinations," *National Education Association Proceedings*, 1932, pp. 359–360.

———, "The Objectivity, Reliability, and Validity of an Essay Examination Graded by Rating," *Journal of Educational Research*, Vol. 24 (October, 1931), pp. 216–223.

———, and Knox, L. B., "The Reliability and Validity of Multiple-Response Tests When Presented Orally," *Journal of Educational Psychology*, Vol. 23 (December, 1932), pp. 656–662.

Stumpf, N. Franklin, "Listening Versus Reading Method in the True-False Examination," *Journal of Applied Psychology*, Vol. 15, December 19, pp. 555–562.

Symonds, P. M., "Factors Influencing Test Reliability," *Journal of Educational Psychology*, Vol. 19 (February, 1928), pp. 73–87.

Tharp, J. B., "The New Examination versus the Old in Foreign Language," *School and Society*, Vol. 26, Nov. 26, 1927, pp. 691–694.

Watson, D. R., and Crawford, C. C., "Four Types of Tests," *High School Teacher*, Vol. 6 (September, 1930), pp. 282–283.

Welch, L. C., "Objective Test and the Stereopticon," *Educational Screen*, Vol. 14 (December, 1935), pp. 285–286; *Sierra Educational News*, Vol. 32 (January, 1936), p. 14.

Wood, Ben D., "The Measurement of Law School Work," *Columbia Law Review*, Vol. 24 (March, 1924), pp. 221–265; Vol. 25 (March, 1925), pp. 316–331.

Woody, Clifford, and others, "A Symposium on the Effects of Measurement on Instruction," *Journal of Educational Research*, Vol. 28 (March, 1935), pp. 481–527.

Worcester, D. A., "On the Validity of Testing," *School Review*, Vol. 42 (September, 1934), pp. 527–531.

Wright, W. W., "The Development and Use of a Composite Achievement Test," *Bulletin of the School of Education*, Indiana University, Vol. 5 (1929), No. 3.

Zubin, Joseph, "The Method of Internal Consistency for Selecting Test Items," *Journal of Educational Psychology*, Vol. 25 (May, 1934), pp. 345–356.

INDEX

Index

Accumulative record of test scores: illustration, 259; use and value, 260

Advantages of objective tests, 300–304

Agriculture tests, see Science tests

Algebra tests: samples of, see Mathematics tests; objective and subjective tests compared, 257–258

Alienation, coefficient of, see Coefficient of alienation

Alternative-response test: definition, 128; rules for constructing, 128–130; directions to students, 130; rules for scoring, 130–131, 270; scoring keys, 131; samples, 131–142

Analogies tests, same as multiple choice in form, 266

Anderson, H. R., 292

Andrus, Harvey A., 211

Answer keys, see Keys of answers

Arithmetic mean: calculation, 235, 240; formula, 237, 239

Arithmetic tests: samples of multiple choice, 23–25; samples of sentence completion, 57; samples of simple recall, 75–76; samples of alternative response, 131; samples of miscellaneous forms, 145–147

Armacost, George H., 298

Art tests: samples of multiple choice, 24, 35; samples of sentence completion, 58, 63; samples of simple recall, 76, 81–82; samples of matching, 104–105, 110; samples of alternative response, 131–132, 134–135; samples of miscellaneous forms, 147–151

Ashbaugh, Ernest J., 289

Association method of validation, 292–293

Attitudes: parents' and teachers', toward grading, 225; rating, 261–262; separated from achievement in grading, 261–262; toward tests, 299–300; toward objective tests, 300; teachers', 309

Baker, Harry J., 233

Beck, Betty S., 272

Beck, Roland L., 255, 272, 290, 296, 306, 307

Beers, F. S., 305

Bibliographies of standardized tests, 308

Biology tests, see Science tests

Bi-serial r method of validity, 292–293

Bixler, Harold H., 260

Board of Examinations, University of Chicago, 309

Bond, Guy L., 233

Bow, Bernice, 153

Briggs, Thomas H., 298

Broom, M. E., 298

Brown-Spearman "prophecy" formula, 282, 287

Buros, Oscar K., 308, 309

Caldwell, J. B., 295

Caldwell, O. W., and Courtis, S. A., 1

Cantor, Eddie, 5

Carrel, Alexis, 12

Chance, correction for, 130–131, 270

Character: rating, 261–262; separated from achievement in grading, 261–262

Chemistry tests, see Science tests

Chronological-order tests, scoring of, 143–145

Citizenship: ratings separated from achievement ratings, 261; use of rating in, 261–262

Civics tests, see Social science tests

Class, E. C., 311

Class recitation, ratings of, 257

Clinical system of grading, 243–254

Coefficient of alienation, 283–285

Coefficient of correlation: definition, 279; formulas, 280; calculation, 280–282

Coefficient of reliability: formulas, 280; calculation, 280–282; definition, 282

Collings, Ellsworth, et al., 7

Commercial tests: samples of multiple choice, 35–37; samples of sentence completion: in bookkeeping, 63–64, in commercial law, 64; samples of

this
book
was
presented
to
the people
of Kansas City
as a gift
from ARTHUR GILBERT